STRUCTURAL DEVELOPMENTS IN THE CANADIAN LIVESTOCK SUBSECTOR: STRATEGIC POSITIONING WITHIN THE CONTINENTAL MARKET

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INTRODUCTION

The significant deepening in the international integration of food markets which is generally observable at the end of the 20th century can be attributed to two main forces. The first is the liberalization of international commercial policy which is manifest in two forms: (1) the creation and strengthening of regional trade agreements and organizations; and (2) the renewed vigour of the multilateral trade system in the wake of the Uruguay Round and the creation of the World Trade Organization (WTO). The second force fostering international integration in food markets is the bundle of inter-related technological changes underlying the process which has become known as *globalization.* While the revolution in electronic information transfers is the most obvious of these changes, revolutions in data collection and data processing, transportation and biotechnology are all major contributors to the internationalization of the agri-food industry.

The removal of formal trade barriers and other impediments to international commercial relations and the technical changes associated with globalization have put agribusiness into a state of disequilibrium. Agribusiness firms (including those in the livestock subsector) must respond to the dual challenges of increasingly open markets and the need to take on board a range of risky new technologies. The reduction or removal of trade barriers means new opportunities in more distant and often unfamiliar markets. This means longer supply chains. Efficient and effective management of longer supply chains may require changes in business organization including transnational investments, strategic alliances or complex contractual relationships. Open markets may also mean the threat of increased competition. Small, isolated firms may find it necessary to seek out partners, sometimes among their old but now equally isolated domestic rivals, to ensure their survival.

New data gathering and processing technologies provide managers with more and better quality information. Information can now be packaged in convenient forms and transferred instantaneously. This information may have economies of scale implications if it can be shared along the entire supply chain. Individual firms, which have traditionally hoarded information because it provided them with strategic advantages when dealing with suppliers or customers, may find themselves disadvantaged relative to vertically integrated competitors or relative to supply chains organized in ways which allow cooperation in the use of information.

More and better information allows agribusiness firms to respond both to consumers' desires for new product characteristics and the need to manage products which have a higher component of intellectual property. The latter means that supply chains, although efficient in the provision of commodities, may not allow the developers of products with a significant intellectual property component to capture the returns on their investment in developing the intellectual property. New forms of organizing supply chains will be required to fully take advantage of the benefits of, for example, biotechnological research.

All of these forces act in concert to impose, through competition, structural change on agriculture. Fundamentally, the structural changes taking place in North American agribusiness relate to changes in how supply chains are organized. Changes in the organization of supply chains are, however, almost impossible to quantify. First, the benefits to firms from reorganizing supply chains come from reductions in the transaction costs associated with coordinating the progress of products as they move along the supply chain. Unfortunately, information on transactions costs is not collected (nor is amenable to collection) by government statistical agencies or through the standard accounting procedures of firms (Hobbs, 1996a). Second, most of the structural changes arising from trade liberalization and globalization have tended to move away from supply chains based on transparent markets towards closer relationships such as contracts, strategic alliances and vertical integration. Information on transactions organized by these means tends to be proprietary and secret. Firms are often reluctant to share this information with researchers because they fear that it may be released inadvertently to their competitors.

As a result, discussions regarding the structural change currently being observed in North American agribusiness is constrained to being largely descriptive rather than quantitative—a point of frustration for agricultural economists and policy makers who are accustomed to the quantitative analysis which can be undertaken with data generated from spot and near-spot markets. The lack of quantitative evidence, however, largely can be overcome by well developed theoretical propositions and a thorough understanding of the industry. The ability to fully test theoretical hypotheses regarding structural changes in the agribusiness sector will have to await the collection of data on transaction costs (Coase, 1972).

THEORETICAL CONSIDERATIONS

In the past, structural adjustments have often been equated with changes in the number and size of farms. Concerns regarding the changing ownership of farms—owner operators, partnerships, family corporations or corporate owned and managed have also been considered under the broad heading of structural change. Markets were the dominant means of organizing transactions and establishing prices. The structural change currently taking place in North American agriculture, however, relates to how agri-food supply chains are organized from the providers of agro-inputs through to the final consumer (Hobbs et. al. 1996). While the reorganization of supply chains will affect farms, its major manifestation will be upon the ways farmers interact with other participants in the supply chain rather than on the size of farms or their number. The structural change will affect farmer's managerial independence (Klein and Kerr, 1995). These changes relate to the evolving nature of vertical coordination of agricultural supply chains of which the effect on farms is only one aspect of a much broader structural change.

New Institutional Economics is concerned with, among other things, the process of coordination in industrial organization. Vertical coordination refers to the organization of transactions along the supply chain. A transaction is required whenever a product moves from one vertically separable stage of production and/or distribution to another (Hobbs, 1996a). Vertical coordination can be accomplished through a large number of mechanisms including market price signals arising from a spot market, contracts, franchises, joint ventures, within-firm managerial orders etc. (Mighell and Jones, 1963).

In New Institutional Economics the term "transaction" takes on a broader meaning than the generally accepted English usage because it includes coordination through within-firm orders given by managers as well as transfers between firms. Extending the firm to encompass an additional transaction within its managerial structure is just one alternative method of coordinating a transaction and establishes the limits to the size of a firm (Coase, 1937). One of the central tenets of New Institutional Economics is that transactions do not occur in the frictionless economic environment assumed in standard neoclassical economics (Hobbs, 1996a). The existence of friction means there are costs associated with organizing transactions—transaction costs. Transaction costs are particularly important when complex transactions are associated with vertical coordination activities. Complex transactions are those where the quality of the goods is not transparent, where there are complicated quality and/or performance specifications and when production and payment take place over time (Kerr, 1996).

The transaction costs associated with complex transactions can be divided into three main classifications: information costs, negotiation costs and monitoring/enforcement costs. According to Hobbs (1996a):

> Firms and individuals face costs in the search for information about products, prices, inputs, buyers and sellers. Negotiation costs arise from the physical act of the transaction, such as negotiating and writing contracts (costs in terms of managerial expertise, hiring of lawyers, etc.) or paying for the services of an intermediary to the transaction (such as an auctioneer or a broker). Monitoring or enforcement costs arise after an exchange has been negotiated. This may involve monitoring the quality of goods from a supplier or monitoring the behaviour of a supplier or buyer to ensure that all the pre-agreed terms of a transaction are met. Also included are the costs of legally enforcing a broken contract, should the need arise. (p. 17).

It is expected that the method of vertical coordination which incurs the lowest transaction costs, *ceteris paribus*, will be the one which survives under competitive pressure. The combination of vertical coordination mechanisms which yields the lowest overall transaction costs will determine the industrial structure of the supply chain. Changes in the relative transaction costs of alternative coordination mechanisms can lead to a new industrial structure for a supply chain. Any altering of the organization of supply chains is likely to be a gradual process with alternative structures operating side by side until competitive pressures force firms using more costly forms of vertical coordination to either adopt the more efficient form or exit from the industry. As suggested above, it may not be possible to quantify the changes in transaction costs but it is important to identify those forces which are likely to alter the relative values of information, negotiation and monitoring/enforcement costs. If these forces can be identified, then transaction cost theory should provide considerable insights into observed and future changes to industrial structure in the North American agri-food system.

FACTORS INDUCING STRUCTURAL CHANGE IN THE CANADIAN LIVESTOCK SUBSECTOR

Trade Liberalization: NAFTA and CUSTA

The changes to Canada's international trade regime for agriculture, which have been brought about over the last decade by the combination of the Canada-United States Trade Agreement (CUSTA), the North American Free Trade Agreement (NAFTA), and the Uruguay Round Agreements including the advent of the WTO, are significant. Structural adjustments in a number of subsectors, and in particular in the western Canadian grains industry, have been the result. The agreements, however, have had little direct effect on the structure of the Canadian livestock subsector.

Tariffs and the effects of non-tariff barriers such as border inspections and unharmonized health, sanitary and phytosanitary regulations are costs associated with organizing international transactions (Kerr and Perdikis, 1995). For example, learning about and complying with foreign sanitary regulations for beef is an additional information cost which must be incurred when organizing an export

transaction. Border inspection fees are a negotiation cost which must be paid to facilitate the export transaction. These costs (or their avoidance) are often used to explain the predominance of a particular method of vertical coordination in international transactions. For example, vertical coordination being undertaken by transnational corporations rather than directly exporting to foreign importers is often explained by the ability of transnational corporations to use within-firm transfer prices to minimize *ad valorem* tariffs (Kerr and Perdikis, 1995). Low export prices are reported to importing customs. The transnational simply charges a higher mark-up on its product in the importing country to offset its lower margin in the exporting operation. If the sale is made to an independent importing firm then the transaction must be undertaken at a price which reflects the normal mark-up for the exporter. As a result, a higher tariff will be paid. Thus, the lower transaction cost represented by the lower tariff gives the transnational form of vertical coordination an advantage over exports based on market transactions.

Liberalization arising from the trade agreements reached over the last decade has not been an important impetus for structural change in the Canadian livestock subsector for the reason that trade in livestock and meat was relatively free prior to the CUSTA. Tariff levels were so low as to be considered a nuisance rather than a real barrier to trade (Kerr and Cullen, 1985). For example, Canada did not have tariffs on the import of live hogs or pork from the United States. The United States had no tariffs on the imports of live hogs, and tariffs of 4.4 cents/kg on some Canadian pork products. Canadian tariffs on live beef animals were only 2.2 cents/kg and 4.4 cents/kg on some U.S. beef products. United States tariffs on cattle and beef were of similar magnitudes. Hence, their removal had little effect on either industry.

A number of non-tariff barriers to trade in livestock and meat did exist prior to the CUSTA (Kerr, et. al. 1986). The Canadian pork industry had been subject to several U.S. countervail actions and, along with a large number of Canadian industries, wished to see changes to U.S. contingent protection procedures. The Canadian beef industry complained about the arbitrary nature of U.S. border inspections for meat. The differences in beef grading systems was seen as a technical barrier to trade (Kerr, 1992). The independent development of health and sanitary regulations in the two countries added to the cost of trans-border transactions.

Each of these non-tariff barriers was dealt with either explicitly or implicitly in the CUSTA. In articles 1906 and 1907 of the Agreement, the two countries agreed to develop a mutually acceptable set of procedures for countervail and anti-dumping. Article 708:3 explicitly made provision for the removal of border inspections on meat. Articles 604 and 609 addressed the harmonization of technical standards such as beef grades. Article 708 promised consultation in the development of new health, sanitary and phytosanitary regulations. As yet, however, none of these provisions has been effective in removing the non-tariff measures affecting the Canadian livestock subsector (Hayes and Kerr, 1997).

The provisions which specified that the new mutually acceptable procedures for anti-dumping and countervail would be developed under a strict timetable were effectively gutted with the removal of the seven year limit for negotiations in the NAFTA agreement (Gerber and Kerr, 1995). Only the marginal improvement which allows bi-lateral panels rather than national courts to adjudge whether correct procedures have been followed by domestic investigative agencies remains of the CUSTA's pledge to remove this major trade irritant. As a result, the Canadian livestock industry does not enjoy a significant improvement in security of access to the U.S. market relative to the pre-CUSTA era.

Despite the commitment to remove border inspections for meat, inspections continue to take place and remain a trade irritant (Hayes and Kerr, 1997). The granting of equivalence for, or harmonization of, beef grading systems in the two countries remains in limbo due to internal wrangling within the U.S. National Cattlemen's Beef Association. This is in spite of a study commissioned by the Association which suggested that the granting of equivalence in beef grades would be beneficial to both industries (Hayes et. al. 1995). Consultation on developing health, sanitary and phytosanitary rules appears to fall short of what was envisioned in the CUSTA (Hayes and Kerr, 1997). In short, little has changed on the non-tariff barrier front and, hence, the Agreements have had only a marginal direct effect on the structure of the Canadian livestock subsector.

One possible effect of the CUSTA/NAFTA may have been an improved investment climate for potential foreign investors in the Canadian meat packing industry. One school of thought is that, from the Canadian point of view, rather than a means to liberalize trade, the CUSTA was a means to protect existing Canadian access to U.S. markets from the threat of increasing protectionism in Congress. The investment clauses in the CUSTA, combined with Canada's unilateral reduction in the powers of the Foreign Investment Review Agency, made it easier for U.S. investors to make *greenfield* investments in Canada or to acquire Canadian firms. The combination of the removal of the threat of capricious U.S. protectionist measures and a simplified and friendlier foreign investment environment may have been instrumental in the decisions of two large U.S. beef packers to invest in facilities in Western Canada. It may also be a factor in current foreign interest in pork processing facilities in the prairies.

The improved investment climate, combined with the continued existence of non-tariff barriers to trade may, indeed, give U.S. multinationals an advantage over Canadian firms in the U.S. market. The beef industry works on the tight distribution timetables required for the efficient operation of *cold chains*. Typically, a U.S. meat importer or broker will have already made a commitment to a final buyer when meat is contracted from a Canadian supplier. If the load is detained or rejected at the border, the importer is unable to fulfil the commitment to the final customer and must seek out alternative suppliers. The multi-plant U.S. meat packers which have plants in Canada will be subject to the same possibility of having loads rejected at the border as a Canadian exporter but will be better able to make up the shortfall in the

U.S. market from product available in its domestic plants. Thus, they are perceived as more reliable suppliers and represent a preferred organizational structure relative to stand-alone Canadian plants in the developing continental market for red meat.

Trade Liberalization: Uruguay Round Agreements

The Uruguay Round agreements have yet to have a significant effect on the markets for Canadian livestock products outside the NAFTA region. The recent WTO disputes panel decision to support the U.S. contention that the European Union's (EU) ban on imports of beef produced using growth hormones could not be justified on scientific grounds may lead to the opening up of the European market to Canadian beef. The EU is currently re-assessing the scientific evidence but is likely to have to comply with the WTO ruling. Compliance, however, may take the form of providing compensation rather than opening up the EU's market, given strong consumer resistance to beef produced using growth hormones. Access to the Japanese market for beef and pork is little affected by the Uruguay Round. The Canadian pork industry struggles to maintain its market share against competitors (Hobbs, 1996b) and the beef industry has struggled to expand its market share in the wake of the Japanese liberalization of its beef import regime (Kerr, et. al. 1994). The difficulties which the Canadian beef industry has encountered in the Japanese market can, in part, be explained by the high transactions costs associated with the export supply chain (Anderson, et. al. 1992). Canada appeared as if it would benefit from the liberalization of the Korean meat importing regime which resulted from the Uruguay Round agreements. The Asian economic crisis, however, has hit Korea particularly hard and any export growth will have to await the recovery of the Korean economy.

The trade agreements have had a considerable indirect effect on the Canadian livestock subsector. The Uruguay Round Agreement (URA) on subsidies (along with the fiscal difficulties of the Canadian federal government) led to the abandonment of the Western Grain Transportation Act (WGTA) rail transportation subsidies for grain. The effect of removing the rail subsidy was to lower the price of grain in Western Canada. The elimination of the Crow Subsidy, combined with the previous abandonment of the Feed Freight Assistance subsidies, has brought natural economic forces to bear, leading to an expansion of the beef and pork feeding industries in Western Canada and the north-south movement of meat products. Western Canadian product can be shipped profitably to beef deficit areas in the western United States, while central Canada can receive increasing supplies from the cattle feeding areas of the US Midwest. There is an ongoing geographic realignment of the industry which reflects the underlying advantage of the prairie region in cattle and hog feeding. The rapid expansion of the feeding industry in southern Alberta near Lethbridge is the most obvious example of this geographic realignment but the resurgence in interest in feeding pigs in a number of places in the prairies also attests to the gradual realignment of the Canadian industry in the post-Crow Rate/WGTA era. The changing economics of the prairie grain industry arising from the removal of rail subsidies for the export of grain and the possibility of further deregulation of the grain market has led to a radical shift in business strategy for one of western Canada's large grain-handling firms—the Saskatchewan Wheat Pool. It has been following an

aggressive program of diversification including substantial investments in the livestock subsector. The objective is to have the organization positioned to take full advantage of growth areas in the continental market.

The expansion of the livestock industry in Western Canada has meant large investments in new facilities. The design and geographic location of these new facilities has been undertaken with an eye to positioning to best take advantage of the developing continental market in beef and pork. To fully capitalize on the continental market, however, firms in the livestock supply chains must respond to the technological forces underlying the process of globalization. These technological advances have been much more important than those arising from trade agreements in forcing structural change on the Canadian livestock subsector.

Globalization

The technological advances that underlie the process of globalization are providing the impetus for structural change in the Canadian livestock subsector. Those who dislike the structural changes which the industry is undergoing often apply the term *industrialization of agriculture* to the new systems of coordination which are emerging. Are the changes observed in the beef and pork industries leading to industrialization—with its connotation of production line rigidities and factory working conditions? Recent developments in the livestock industries fundamentally are changes to the way supply chains are coordinated. They are altering how the major actors in the meat production and distribution system, e.g., input suppliers, ranchers, feedlot operators, meat packers and retailers, deal with one another. Instead of competitive advantages stemming from better production technologies, lower input costs or even better management, the competitive edge is also now seen to arise from reorganizing the supply chain.

Heterogeneous Tastes and Niche Markets. The revolution in the electronic transfer of information allows firms to access information on distant markets instantaneously. This information flow consists not only of price information but also information on quality specifications and product preferences. It also lowers the cost of acquiring information on the reputation of potential customers/suppliers. This widens the available markets. Furthermore, it increases the ability to cater to niche markets which require products with unique characteristics.

The existing system of vertical coordination in livestock supply chains was well suited to consumers with relatively homogeneous tastes. Homogeneous tastes meant that the supply chain focused on the production and processing of animals with a single set of characteristics which were set out in the parameters of the premium grade. The biological nature of livestock production meant that not all animals would achieve the premium grade but producers had a stylized animal at which to target their production practices (Considine, et al, 1986). If an animal failed to reach the premium grade, it received a discounted price. The discounts were well established and understood. As long as sufficient buyers existed, prices could be determined though competitive auctions. Markets were the vertical coordination

mechanisms. The public nature of auctions provided a valuable externality to farmers in the form of a transparent and relatively inexpensive price information system.

If the number of buyers declined to the point where auctions could not ensure competitive pricing, alternative vertical coordination mechanisms had to be found. Formula prices set by provincial hog marketing agencies and board-run electronic auctions in Canada are but two examples. Processors and retailers shared the preparation of meat cuts butchered from relatively homogeneous carcasses for consumers whose eating habits required a simple set of characteristics—freshness, tenderness, marbling, limited external fat, etc. In this system, farmers were left independently to produce target animals to the best of their abilities. The *farm gate* provided a barrier behind which farmers could manage their operation without fear of interference from others in the livestock supply chain (Klein and Kerr, 1995).

The system described above begins to break down when consumers no longer have homogeneous tastes or when they demand products with additional characteristics which cannot be incorporated into the existing grading system. When consumers' tastes are no longer homogeneous, animals with different characteristics are required. This means that individual buyers will require animals which differ from other buyers. This removes the competitive aspect of price setting. Prices must be negotiated one-on-one with buyers. Further it means that the farmer has produced a specialized animal which will not be as valued by other buyers and will be heavily discounted if the farmer attempts to switch buyers once the animal is produced. This leaves the farmer vulnerable to *opportunism* by the buyer. If the farmer produces these specialized animals on speculation, as in the traditional supply chain, the buyer has considerable negotiating power since the farmer has a perishable product and no other comparable buyer for the product.

Buyers are also vulnerable because they typically have product commitments further down the supply chain but no assurance that these can be filled without some formal arrangement with individual producers to provide animals with the particular set of characteristics. The vulnerability of both farmers and processors means that speculative feeding carries considerable risks: i.e. the information and negotiation costs of speculative feeding are high.

The solution is some form of contractual arrangement between producers and buyers. However, this increases some transaction costs. Processors may have to commit to a purchase price prior to the farmer committing resources to production. This means they must incur higher transaction costs in acquiring price information—because they must attempt to forecast their selling price in the future so as to determine the price they can safely offer the farmer prior to production. With no transparent pricing system, farmers are forced into spending more time gathering information prior to negotiations with processors.

The poultry supply chain in the United States has moved the furthest down the road to specialized production, with the supply chain already having undergone a major change. In the United States, ninety percent of broilers are produced under contract and spot markets no longer exist (Sheldon, 1995). Of course, the poultry industry, with its short generation interval, can quickly breed and produce birds tailored to the needs of any individual customer. Over the last decade, the U.S. pork industry has begun to follow the poultry industry in tailoring hogs. Nearly twenty percent of hogs in the United States were grown on contract in 1990 compared to 1.5 percent in 1980 (O'Brian, 1994). It is probably not surprising that one of the areas of discussion when new investments in hog processing are being considered for Western Canada is the role that provincial hog boards will play in price setting. Single desk selling has been a primary function of some hog boards but new processors want the flexibility to engage in contracting. This is the only way they feel they can be competitive in a continental market where contracting is proving to be the efficient form of vertical coordination. Of course, some existing hog farmers are worried about the dependency created by contracting and the unequal bargaining power which arises in one-on-one negotiations with processors. It is clear that this structural change is beginning to take place in the pork industry in Western Canada.[1] The Quebec industry has been characterized by contractual relationships among members of the supply chain for decades and this close relationship is suggested as one reason for the industry's success.

Food Safety, Quality Assurance and Traceability. A second, but related, force for change revolves around the increased emphasis placed on food safety and quality assurance issues in the livestock subsector. Consumers are demanding additional characteristics associated with their beef. For example, supermarkets in Britain now offer guarantees that the animals from which their meat products are derived have been raised on farms with high animal welfare standards. This requires increased traceability from the supermarket back to the farm. It also means that a degree of the farmer's managerial independence has been removed. Other players have passed through the farm gate to intrude into the farmer's managerial decisions. The Bovine Spongiform Encephalopathy (BSE) crisis, and other concerns with food safety, have led to the use of a system of cattle passports and movement documents which allows the history and movement of any beef or dairy animal to be traced. The EU requires that a computer data base be established which will record both the identification number of all beef animals present on a farm or other facility and changes in the whereabouts of each beef animal starting from where the animal was born. In the United Kingdom (UK), this database will be operational at the end of 1999.

At the heart of traceability is the improvement of food safety. However, once the system is in place it can also be adapted to provide information on quality and other desired characteristics such as animal rearing practices or *organic* production. The latter can be seen simply as special characteristics desired by consumers whose preferences differ from those of other consumers. In other words, they represent

[1]As of May 1998, each of the three prairie hog marketing boards has been deregulated to allow opting out by producers (Ed.).

niche markets. These characteristics require traceability systems to assure consumers that the product they purchase has the desired characteristic. The attributes cannot simply be incorporated into the grading system. Further, improved food safety and better quality control require traceability and the introduction of standardized quality control measures along the supply chain. The electronic collection and management of large quantities of data have now reduced the cost of acquiring and utilizing these forms of information. Cooperation along the supply chain is necessary because livestock and meat production represent interactive and interdependent biological systems where the effort which one segment of the supply chain takes to improve quality or food safety can be negated by the inattention of another player along the supply chain.

Given the large dependence of the Canadian beef industry on the U.S. market, changes in the U.S. industry must be watched closely in Canada. For example, the Canadian Cattlemen's Association (CCA) has introduced a quality assurance program (*Quality Starts Here*). In its manual for cow-calf producers, the CCA stresses the importance of the continental market:

> ...our growing export dependency...Canada's beef industry is export dependent...It is in our best interest to set a higher standard for product quality and safety to ensure market access. (CCA, 1997a).

In an address to the 10th World Meat Congress in 1995, Dr. J. Prucha, Deputy Administrator of the U.S. Federal, State and International Inspection, Food Safety and Inspection Service stated that:

> Just like domestic plants, foreign plants exporting meat to the United Stares will need to operate using a formalized, documented HACCP system—or an equivalent risk-based scientific process control system. (Prucha, 1995, p. 23).

In the wake of highly publicized E. coli outbreaks, inspection services in the United States were refocused toward reducing pathogenic micro-organisms. A shift in focus within the U.S. industry was also encouraged. Prevention was to replace detection as the objective of food safety programs. A core part of this strategy is the adoption of Hazard Analysis Critical Control Point (HACCP) programs. Meat processing plants are required to implement HACCP programs which can be verified by government inspectors. The United States requires that a country wishing to export meat to the United States prove that its system of safety procedures and inspection is equivalent to those in the United States.

The Canadian industry, however, has ample domestic reasons for wishing to improve food safety procedures. The devastating effects of breaches in food safety in other countries has not been lost on the industry. In a document proposing a national identification system for Canadian beef, the CCA (1997b) warns that:

> Industry leaders have received ample evidence of the need for such a capability and the cost consequences of complacency. In briefest justification, a devastating disease such as Bovine Spongiform Encephalopathy (BSE) might as suddenly occur within our industry as it did in Britain and with similar consequences. (p. i).

Further, they state:

> Recent food safety issues in other countries and in various commodities have demonstrated what can happen to a market. Conversely, California strawberry growers were able to maintain market access in the middle of their food safety issue, by demonstrating the unsafe products were not theirs by means of an identification system. (p. 18).

Clearly, the message is that it must not be allowed to happen in Canada.

The Canadian livestock industry associations have taken the lead in developing quality assurance schemes. The Canadian Pork Council (CPC) developed a national quality assurance scheme at the farm level. A manual was produced which specified good production practices and record keeping. The focus is on enhancing food safety. The scheme was piloted on a trial basis in 1997. The hog quality assurance scheme is based on HACCP principles with independent verification of on-farm standards and judgement as to whether a producer can claim to have produced animals in accordance with the rules of the quality assurance scheme. The scheme is, however, voluntary.

The CCA has developed a number of quality assurance schemes for the various segments of its industry. The *Quality Starts Here* program was developed through collaborative discussions with all those along the food chain—cow-calf operators, feedlots, packers, veterinarians and pharmaceutical companies. The objective was to develop a set of good production practices to deal with sanitation and feeding issues and to minimize problems arising from lesions and bruising at injection sights and with drug residues. It is important to note that this program was developed to improve the beef supply chain as a whole and to augment the processing industries' in-plant HACCP programs. In part, it attempts to reduce information costs along the supply chain. Manuals have been produced and distributed to those interested including: *Good Practices Guides* for cow-calf operators and feedlots and *Recommended Operating Procedures for Feedlot Animal Health*. The procedures are based on HACCP concepts. Little is known about the degree to which they have been adopted. At present, the CCA schemes do not include provisions for independent monitoring of cow-calf operations or feedlots. This may be a weakness of the scheme as it may not be accepted by those further along the supply chain (by retailers or the Hotels, Restaurants, and Institutions [HRI] trade) and, in particular, export markets. Without independent accreditation, this quality assurance scheme cannot claim to be

HACCP-based. If, over time, producers feel that they receive a premium for animals raised according to the specifications of the quality assurance scheme, pressure may increase to have independent verification.

The CCA has also endorsed a national animal identification scheme. Technical details still need to be worked out to ensure that maximum use can be made of the information. The need for the information to be transferred from the live animal to the carcass remains a technological challenge. However, there is cooperation to find a solution. It is intended that:

> In the event of an incident that requires traceback, it will be possible with this system to identify the last herd (feedlot, pasture group, etc.) in which the subject animal was located and, from the ear tag, the herd of origin. Equipped with these two pieces of crucial information health authorities will be able, in most cases, to trace the movements of the subject animal(s). (CCA, 1997b, p. vi).

The beef industry association's quality assurance scheme, however, remains voluntary and without independent audits. Given the possible shortcomings of the scheme, it is probably not surprising that beef processors have initiated quality assurance schemes of their own. Beef packers, particularly those involved in international sales, exhibit a growing recognition of the importance of HACCP-based quality assurance schemes. Given that plant-based HACCP schemes have a considerable fixed cost associated with their implementation, it is probably not surprising that larger plants implemented HACCP procedures first (Molder et al, 1995).

Having put plant-based HACCP programs in place, a number of beef packers have been attempting to institute quality assurance schemes among their suppliers. Strategic alliances have been negotiated with feedlot and cow-calf operators based on company-specific quality assurance schemes. For example, in the fall of 1997, Cargill launched a program in Western Canada entitled *Beef Works*. The quality assurance scheme is based on a program which has been operating since 1995 in Nebraska. *Beef Works* is designed primarily for cow-calf operators who wish to maintain ownership of their cattle through to slaughter. Cargill Foods must certify the genetic suitability of the producer's calves. Once the cow-calf operator is approved he/she must sign up a specific lot of cattle for the *Beef Works* scheme. Cargill guarantees to purchase the animals when they are ready for slaughter. A set of *best practices* designed to maximize quality of the carcass are provided by Cargill. Some of these *best practices* are mandatory while others are simply recommended. Feeding at the cow-calf level is at the discretion of the producer although there are recommended dietary guidelines. When the calves are moved into the feedlot, the animals must be fed a ration specified by Cargill and based on the company's feed inputs. Using ultrasound technology on live animals, Cargill advises producers of the optimum time to slaughter their cattle. Price is determined on the basis of carcass grades using Cargill's value-based pricing grid which assigns premiums and deductions according to the quality of the carcass. This private evaluation of carcasses assesses quality in a much more detailed fashion than the government grading system.

As a member of the scheme, *Preferred Cattle Suppliers* and *Preferred Feedlots* receive detailed information on the carcass, feedlot growth performance and the profitability of each animal. Producers can use this information to aid in their breeding and feeding decisions and to evaluate their management practices. Clearly, this scheme is a far cry from speculative feeding for a homogeneous market and represents a fundamental change in the structure of the beef supply chain. While the scheme is still very new, it may represent the way information flows can be enhanced and transaction costs can be reduced in the process of improving beef quality. Some Canadian beef packers have initiated similar schemes and others are considering them. If they improve the profits of both packers and producers, they may prove to be more competitive than the existing system. In the process, other players have passed through the farm gate and have an interest in on-farm management practices. This alters the relationship between those operating along the beef supply chain.

The major change which strategic alliances and other forms of cooperation along the red meat supply chain have brought is the sharing of information. Improved electronic data collection and handling facilitate this process but it represents a fundamental change in how producers and processors approach the use of information. When the supply chain was largely coordinated through auctions and other forms of spot markets, information could be used strategically to gain commercial advantage for individual participants along the supply chain. Auctions allowed farmers to bundle animals which they knew had poor performance characteristics with better performers in the hope that buyers would be fooled—an asymmetric information problem. Processors, on the other hand, expected that their buyers could use their expertise and superior market information to pick up bargains; for example, cattle purchased on a liveweight basis which would subsequently produce higher meat yields than that represented by the liveweight purchase price. This system is inherently confrontational and leads to distrust among supply chain participants. There is considerable evidence that supply chains organized on a more cooperative basis can lead to efficiency gains (Hobbs, 1996b).

It is interesting to note that, as yet, cooperation along the supply chain has not extended to any great extent to the interface between packers and retailers. In the UK, where consumer advocacy is stronger than in Canada, supermarkets have become heavily involved in cooperative ventures along livestock supply chains—particularly over food safety and animal welfare issues (Hobbs, 1996c). The experimental program implemented between the Loblaws supermarket chain and XL Beef of Calgary to provide *natural* beef to the Ontario market represents one example of such cooperation. The program required strict monitoring of production practices, including XL Beef's own vertically integrated farm operations, and strict traceability through the entire supply chain. While the program did not prove profitable over the long run due to consumer resistance to the price premiums required for *natural* beef, it is an example of an entire supply chain cooperating to provide consumers with non-traditional product characteristics. Another example is a currently operating strategic alliance between Cargill and the Loblaws supermarket chain in Ontario for the supply of case ready meat. However, at present, these examples remain the exception rather than the rule.

The two forces for structural change, i.e. the desire for niche market animal products and the demand for improved food safety, emanate from consumer preferences. The third force which will promote the need for structural change in the Canadian livestock subsector arises from changes in production technology.

Production Technology and Agricultural Research. The major underlying change in agricultural production stems from a revolution in the agricultural research industry. A number of forces are altering the way agricultural research is funded, organized and conducted (Klein and Kerr, 1995). The fiscal difficulties of the Canadian governments has led to a considerable decrease in government research funding (a 20 percent reduction in Federal funding was announced in 1995) and has forced researchers to seek out private partners. An incentive is provided through matching grants. Fiscal restraint, however, is only part of the story. The traditional rationale for public funding of agricultural research was a *public good* argument (Davies and Kerr, 1997). With natural reproduction it was seldom possible for those who invested in research to capture the gains arising from that research. This would mean underinvestment in research. The increasing demand for niche market products discussed above, combined with biotechnological research processes, mean that those who are willing to invest in the research are more likely to capture sufficient returns to justify their risk-adjusted initial investments.

The changes in vertical coordination mechanisms in U.S. pork supply chains illustrate the importance of the new livestock research environment. Historically, breeding stock were produced by specialized breeders or producers who followed a cross breeding program to raise their own replacements. To meet the market driven requirements of higher carcass quality, large integrated pork supply chains have contracted with large genetics companies such as Pig Improvement Co. (PIC) and Newsham Hybrids Inc. (mostly European based) for their breeding stock (Klein et al, 1995). The genetics companies conduct their own research and capture the rewards through the sale of their unique breeding stock.

The developments in hog breeding have also affected the vertical coordination mechanism. In the past, there was a strong transparent market for breeding stock. Most purebred breeding stock was sold through auctions. With the entrance of the new genetics companies, there is no longer a need to use auction sales. These companies sell directly to their customers and also provide recommendations on breeding programs so that producers can maximize the potential of the animals they purchase. They have been particularly successful in marketing to large hog producers. Again, others have passed through the farm gate and have an interest in on-farm management practices.

An increasing proportion of the new research in agriculture is encompassed within the umbrella of biotechnology. Although field testing will always remain location specific, genetic manipulations and the development of monoclonal antibodies can be done in laboratories anywhere in the world. This means there will be opportunities for research laboratories to specialize internationally and *trade* their research and products. Most products of biotechnological research can be patented

and, thus, restricted in their use to only those who can pay. This creates opportunities for the private sector to participate and profit from agricultural research. These specialized products will often require the sharing of information and managerial expertise with human capital dedicated to the individual product. This suggests a greater degree of vertical integration initiated by input suppliers or through strategic alliances between input suppliers and producers. Of course, the ability to genetically tailor animal inputs dovetails with the consumer desires for niche products and increased food safety. This suggests gains from sharing information all along the supply chain. Although commercially still in the future, transgenic animals, and even clones, may alter the cost of monitoring production, hence, suggesting changes to the organization of supply chains (Hobbs and Kerr, 1998). While the full effect of the biotechnological revolution has not yet been felt in the large animal industries, including those in Canada, the potential to induce structural change appears to be considerable.

CONCLUSIONS

Structural changes tend to take place over long periods of time. They are not easily measurable and are by their very nature disequilibrium phenomena. Hence, they are not particularly amenable to the comparative statics analysis which economists find most tractable. When economic systems are in disequilibrium, paths of adjustment are seldom linear or transparent. It is a time for experimentation and for incorrect paths to be explored. All of this makes the task of predicting new equilibriums extremely difficult. It is important, however, to have a strong theoretical basis for analysis and to identify the forces which are at work.

The Canadian livestock industry was operating in a continental red meat market even before the recent agreements to liberalize trade within North America and multilaterally. The trade agreements have ensured that Canada will have continued access to continental markets over the long run. While trade irritants in the form of non-tariff barriers remain, the increased security of access has altered the investment climate for both large U.S.-based agribusiness firms such as Cargill and IBP, and Canadian agribusinesses such as the Saskatchewan Wheat Pool. New investments are made with the realities of the continental market in mind. The multilateral disciplines on subsidies arising from the Uruguay Round have put the Western Canadian grain industry on more of a market basis and, as a result, has altered the location economics of the Canadian livestock industry.

The changes arising from new international trade regimes are not, in themselves, sufficient to lead to a structural change in the Canadian livestock subsector. The changing location economics and trade flows have led, however, to opportunities for new investments. Those considering investing in the Western Canadian livestock industry wish to position themselves to best take advantage of the continental market. To do this, they need to examine new ways of organizing supply chains because the technologies underlying the process of globalization seem to point to clear advantages to a more cooperative approach to vertical coordination in supply chains. In particular, the sharing of information along the supply chain

appears likely to lead to improved efficiency. Of course, the revolution in electronic information technology means that more and better information can be collected and disseminated at a lower cost. This cooperative approach to supply chain management is the real structural change taking place in the livestock subsector.

Of course, new organizational forms are more likely to be associated with new investments, e.g. the move to contracting hogs in Western Canada. This does not mean that the pressure to change will not be felt in the existing supply chains but a substantial amount of previous investment is based in the current vertical coordination institutions and there will be considerable vested interests in the status quo. In particular, the loss of farm level managerial independence implied by the new forms of organization is likely to be resented and resisted by many farmers. Old habits of confrontation along the supply chain—between producers and packers or processors and retailers—will not easily be forgotten. Institutions such as provincial hog boards may well adapt and have a positive role to play in assisting farmers in an era of contracts and managerial oversight.

One thing seems clear, the new structure that emerges in the Canadian livestock subsector will be based on information sharing and closer managerial cooperation.

REFERENCES

Anderson, C. L., Hobbs, J.E. and Kerr, W. A. 1992. "Transactions Costs and the Benefits of Trade: Liberalizing the Japanese Importing System for Beef." *Asian Economic Journal*, 6 (3): 289-301

Coase, R. H. 1937. "The Nature of the Firm" *Economica*, 4: 386-405.

Coase, R. H. 1972. "Industrial Organization: A Proposal for Research." In Fuchs, V.R. (Ed), *Policy Issues and Research Opportunities in Industrial Organization*, National Bureau of Economic Research, New York, 59-73.

Canadian Cattlemen's Association (CCA) 1997a. *Canadian Cattlemen Quality Starts Here: Good Production Practices for Cow-Calf Producers.* Producer Manual, CCA, Calgary.

Canadian Cattlemen's Association (CCA) 1997b. *Business Plan for a National Identification Scheme for the Canadian Beef Cattle Industry.* August, CCA Calgary.

Considine, J. E., Kerr, W. A., Smith G. R. and Ulmer, S. M. 1986. "The Impact of a New Grading System on the Beef Cattle Industry: The Case of Canada." *Western Journal of Agricultural Economics*, 11 (2): 184-194.

Davies, A. S. and Kerr, W. A. 1997. "Picking Winners: Agricultural Research and the Allocation of Public Funds." *The Review of Policy Issues*, 3 (3): 39-50.

Gerber, J. and Kerr, W. A. 1995. "Trade as an Agency of Social Policy: NAFTA's Schizophrenic Role in Agriculture." In Randall, S. J. and Konrad, H. (eds.) *NAFTA in Transition*, University of Calgary Press, Calgary: 93-111.

Hayes, D. J., Hayenga, M. L. and Melton, B.E. 1995. "The Impact of Grade Equivalency on Beef and Cattle Trade Between the United States and Canada." *U.S. Meat Export Analysis and Trade News*, 13 (12).

Hayes, D. J. and Kerr, W. A. 1997. "Progress Toward a Single Market: The New Institutional Economics of the NAFTA Livestock Sectors." In Loyns, R.M.A et al (eds.). Proceedings of the Third Agricultural and Food Policy Systems Information Workshop, Tucson Arizona in *Harmonization/Convergence/Compatibility in Agriculture and Agri-Food Policy: Canada, United States and Mexico.*

Hobbs, J. E. 1996a. "A Transaction Cost Approach to Supply Chain Management." *Supply Chain Management*, 1 (2): 15-27.

Hobbs, J. E. 1996b. *Danish Pork in the Asia-Pacific Rim Markets: A Culture of Excellence.* EPRI Study 96-01. Excellence in the Pacific Research Institute, University of Lethbridge, Lethbridge.

Hobbs, J. E. 1996c. "A Transaction Cost Analysis of Quality, Traceability and Animal Welfare Issues in UK Beef Retailing." *British Food Journal*, 98 (6): 16-26.

Hobbs, J. E. 1997. "Measuring the Importance of Transaction Costs in Cattle Marketing." *American Journal of Agricultural Economics*, 79(4):1083-1095.

Hobbs, J. E. and Kerr, W.A. 1998. "Cloning: Will it Change the Management of Supply Chains?" *Supply Chain Management*, 3 (1): 17-20.

Hobbs, J. E., Kerr, W. A. and Klein, K. K. Forthcoming. "Coordination and Competitiveness of Supply Chains: Implications for the Western Canadian Livestock Industries." *Canadian Journal of Agricultural Economics.*

Kerr, W. A. 1992. "Removing Nontariff Barriers to Trade Under the Canada-United States Trade Agreement: The Case for Reciprocal Beef Grading." *Journal of Agricultural Taxation and Law*, 14 (3): 273-288.

Kerr, W. A. 1996. "Managing Risk and the Organization of Transactions: A Perspective from the Pacific Rim." *Jurnal Manajemen Prasetiya Mulya*, 3 (6): 1-7.

Kerr, W. A. and Cullen, S. E. 1985. "Canada-U.S. Free Trade—Implications for the Western Canadian Livestock Industry." *Western Economic Review*, 4 (3): 24-36.

Kerr, W. A., Cullen, S. E. and Sommerville, M. F. 1986. *Trade Barriers and the Western Canadian Livestock Industry*, Working Paper 11/86, Marketing and Economics Branch, Agriculture Canada, Ottawa.

Kerr, W. A., Klein, K. K., Hobbs, J.E. and Kagatsume, M. 1994. *Marketing Beef In Japan.* Haworth Press, New York.

Kerr, W. A. and Perdikis, N. 1995. *The Economics of International Business*, Chapman and Hall, London.

Klein, K. K. and Kerr, W. A. 1995. "Globalization of Agriculture: A View from the Farm Gate." *Canadian Journal of Agricultural Economics*, 43: 551-563.

Klein, K.K., Faminow, M.D., Foster, K., Larue, B., Romain, R. and Walburger, A. 1995. *Hog Marketing Systems in Canada.* Policy Branch, Agriculture and Agri-Food Canada, Ottawa.

Mighell, R. L. and Jones, L. A. 1963. *Vertical Coordination in Agriculture*, Agricultural Economics Report No. 19, ERS, USDA, Washington.

O'Brian, P.M. 1994. "Implications for Public Policy." In Schertz, L. P. and Daft, L. M. (eds.) *Food and Agricultural Markets: The Quiet Revolution*, National Planning Association, Washington, D.C.: 296-318.

Molder, P. J., Schroeder, GG. and Agyirey-Kwakye, K. 1995. *An Analysis of Industry Readiness to Accept the Concept of HACCP.* Report submitted to Agriculture and Agri-Food Canada, Food Production and Inspection Branch, Ottawa, December.

Prucha, J. C. 1995. *New Approaches to Food Safety Reform.* 10th World Meat Congress, Denver, Colorado.

Sheldon I., 1995. "Contracting, Imperfect Information and the Food System." In Padberg, D. (ed.) *Public Policy in Foreign and Domestic Market Development*, Texas A & M University, College Station, Texas: 41-54.