

## The Role of Institutional Change in the Industrialization Process: The Case of Grades and Standards in the UK-US-Michigan Dry Bean Agrifood System

**Abstract:** A case study of the UK-US-Michigan dry bean agrifood chain is used to build an institutional change framework, showing how an institutional change at one level of the system can induce technological, organizational, structural, and institutional change at other levels of the system. Specifically, the dry bean case study shows that a change in food and agricultural standards (institutional change) induces technological, organizational, structural, and institutional change through different levels of the agrifood chain, from consumers to canners to elevators, as well as across borders, the US and UK. As the forces of industrialization and globalization become increasingly complex and intertwined, policy makers and managers must be aware of how institutional change, specifically changes in food and agricultural standards, affect the “rules of the game” for an industry. This includes defining the good that is traded, who can participate in an industry, and the relationships among the actors.

### 1. Introduction

Food and agricultural standards (FAS) have recently emerged as a hot topic of debate in the agrifood system. The role of FAS in the agrifood system has shifted from one of commodity definition to lower transaction costs to that of a strategic tool for product differentiation (Leat, et al., 1998) and market formation and protection for both private industries and governments (Reardon, et al., 1999).

FAS are institutions, i.e., sets of ordered relationships among people that define their rights, their exposure to the rights of others, their privileges, and their responsibilities (Schmid, 1987). They are a set of working rules that define a commodity. Thus, FAS are an important component of the institutional structure of the agrifood system because they affect the trust and linkages among actors by assuring quality, consistency, and transparency.

FAS change is a form of institutional change. Institutional change is an important determinant in the industrialization<sup>2</sup> process of the agrifood industry because it affects organizational,

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technological and structural change as well as concomitant institutional change. However, the literature (Barry, 1995, Schertz and Daft, 1997) has primarily focused on market uncertainty and risk using a transaction cost approach. Little is known about the effect of institutional change on the process of agrifood industrialization.

Thus, the purpose of this paper is to identify institutional change as a key determinant in the industrialization process of the agrifood system and present an analytical framework of the role of institutional change in the process of industrialization. Specifically, the paper addresses the effect of institutional change on technological, organizational, structural change and subsequent institutional change. The framework is then illustrated using a case study of the UK-US-Michigan dry bean agrifood chain. The illustration of the effects of institutional change on the industrialization process will be of particular interest to agribusiness researchers and practitioners because such illustrations are rare in the literature.

## **2. Conceptual Framework Regarding the Role of Institutional Change in the Process of Industrialization in the Agrifood System**

Several theories of institutional change<sup>3</sup> exist, the property rights view (Coase, Demsetz, and Posner), the theory of induced institutional innovation (Hayami and Ruttan), North's theory, and Bromley's theory. However, the causes and effects of institutional change on the process of industrialization of the agrifood system are just beginning to be explored. This section will outline a conceptual framework regarding the role of institutional change in the process of industrialization, specifically how institutional change affects changes in relative prices, technological change, organization and structural change and secondary institutional change. This conceptual framework is shown in figure 1.

Before one can begin to consider the effects of institutional change, the cause of the institutional change needs to be identified. One of the driving forces behind industrialization in the agrifood system has been the need to meet changing consumer preferences. North (1990) and Bromley (1989) both identify changes in consumer preferences as a force for institutional change. Another determinant of institutional change is changes in the power structure among actors in system. Thus, changing consumer preferences and a changing power structure among actors in the system lead to institutional change at the processing/manufacturing level of the agrifood system.

Prices and thus, what is defined as a cost and to whom are a result of a given institutional structure (Samuels and Schmid, 1997). When institutional change occurs, the prices of goods change in response to the new institutional realities (i.e., rights structures) in the industry<sup>4</sup>. Thus, changes in relative prices follow this type of institutional change rather than drive it.

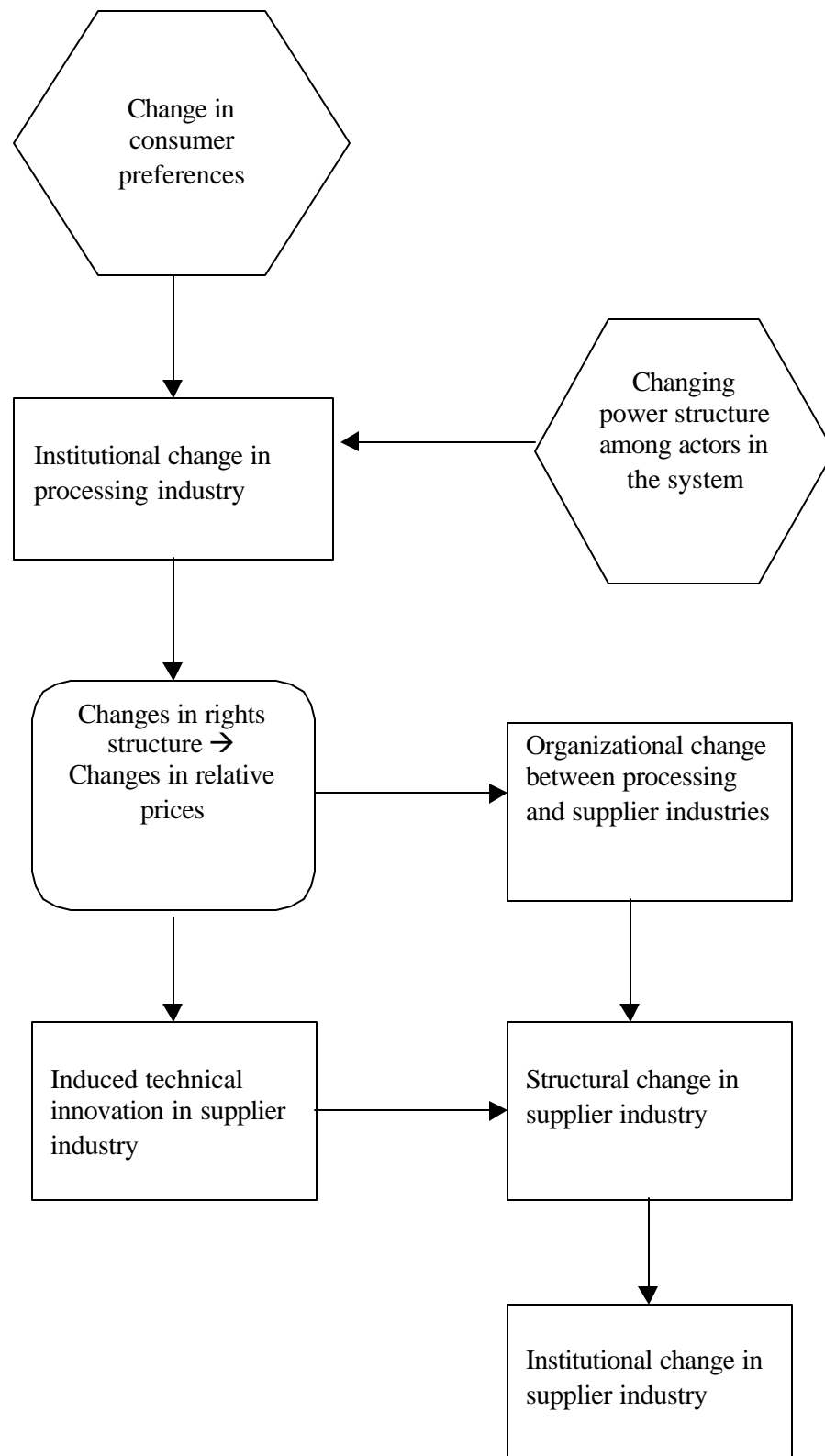
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<sup>2</sup> Abdalla and Shaffer (1997) define industrialization as an economic reorientation of the food and agricultural sectors where specialization in work and trade, including the introduction of new technologies, advances productive output.

<sup>3</sup> See Bromley's *Economic Interest and Institutions* (1989) for a review and critique of the theories of institutional change.

<sup>4</sup> Bromley (1989) states, "the prevailing institutional structure gives rise to a constellation of costs and benefits that only obtain meaning and magnitude from that very institutional structure."

**Figure 1: Conceptual Framework Regarding the Role of Institutional Change in the Process of Industrialization of the Agrifood System**



Changes in relative prices induce two effects, technological innovation (Hayami and Ruttan, 1970) at the supplier (intermediate) level and changes in industry organization (coordination) between the processor level and the supplier level. Both technical innovation and organizational change contribute to structural (industry structure) change at the supplier level. Higher cost producers are driven out of business as new technology is adopted (Cochrane, 1993) leading to increased consolidation and concentration. Also, economies of scale in initial processing contribute to increased consolidation. The structural change then leads to an additional institutional change at the supplier level.

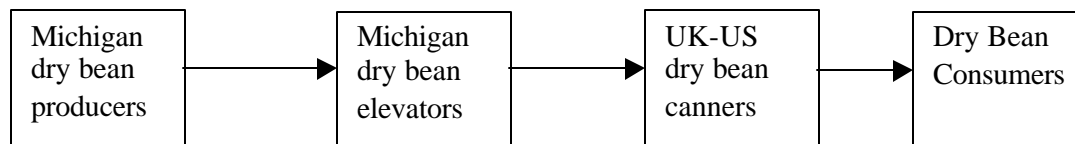
### **3. An Application of the Conceptual Framework of the Role of Institutional Change in the Process of Industrialization: the UK-US-Michigan Dry Bean Agrifood Chain**

#### **3.1 Introduction and structure of the dry bean agrifood chain<sup>5</sup>**

The UK-US-Michigan dry bean agrifood chain was chosen as the case study because of the strong cross-border, inter-market linkages and the importance of dry beans in the Michigan agrifood system. Michigan is the second largest dry bean producing state in the United States (US) accounting for 17% of total US production. The top export market for the U.S. is the United Kingdom (UK). The US is the leading exporter of dry beans to the UK holding a 52% market share for dry beans. Navy beans are particularly important because the UK accounts for 77 percent of US navy bean exports which is 63% of the UK navy bean market (Economic Research Service, 1998). The UK is a particularly important trading partner for Michigan because over 40% of the dry navy bean crop is marketed there (Kelly, 1992).

A simple diagram of the UK-US-Michigan dry bean agrifood chain is illustrated in figure 2.

**Figure 2**

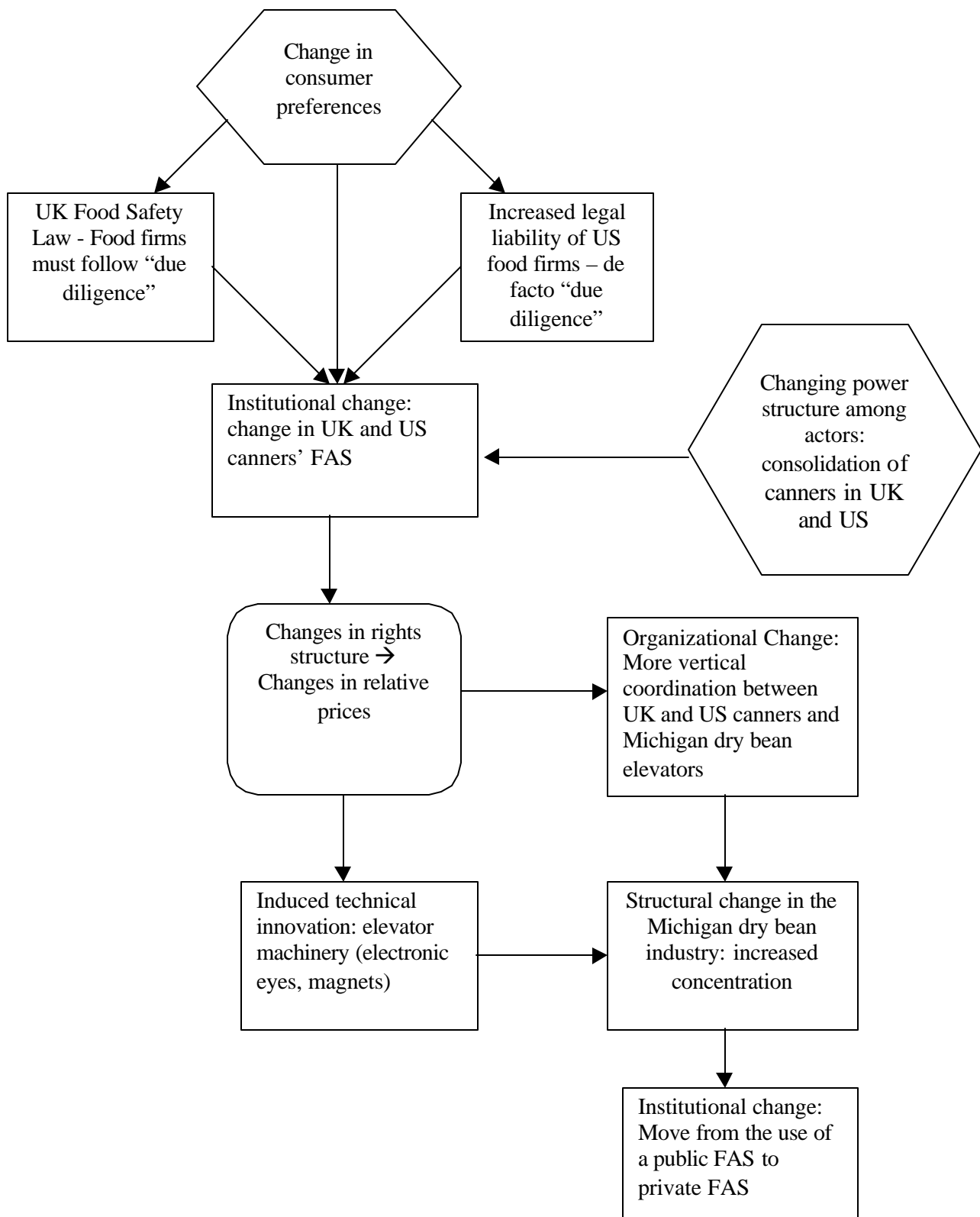


Dry bean elevators serve the function of assembling and cleaning the dry beans, i.e. initial processor. According to an industry key informant, the canning market accounts for 90% of most elevator's sales, while the remainder goes to the bagged market. The most important canning markets for Michigan dry beans are the UK and the US. Thus this case will focus on the canners in the UK and US, elevators/shippers in Michigan, and growers in Michigan. Figure 3 shows the UK-US-Michigan dry bean application of the conceptual framework of the role of institutional change in the process of industrialization.

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<sup>5</sup> This section is based on interviews with dry bean industry experts, elevators, and farmers in the state of Michigan and a review of the relevant literature. The interviews with industry experts were conducted in January and February of 1999 while the farmer and elevator interviews were conducted in March, April, and May of 1999. The authors thank Holly Dygert for her participation in the interviews.

**Figure 2: UK-US-Michigan dry bean application of the conceptual framework of the role of institutional change in the process of industrialization**



### **3.2 Changing Consumer Preferences and Power Structure**

Consumers in the UK and US have changed their preferences with respect to food quality, especially food safety. In other words, consumers are demanding higher quality food with respect to safety, taste, nutritional value, appearance etc. Specifically, preferences have become visible through the Food Safety Act of 1990 in the UK. and the increased threat of civil litigation in the US.

The British Food Safety Act of 1990 was passed because of increasing consumer concerns with food safety (Hobbs and Kerr, 1992). The key concept in this new law is due diligence. Under due diligence food companies must show all reasonable precautions were taken to ensure the safety of the product. This includes precautions taken during the production process and precautions to ensure that purchased inputs are safe (Ministry of Agriculture Fisheries and Food, 1996). However, the act does not specify any specific requirements (i.e., certificates of origin etc) as to how food companies should monitor their suppliers.

In the U.S., there is not a specific law requiring food companies to follow due diligence. However, the threat of civil litigation from injured consumers has led food companies to practice a form of due diligence.

The power structure among actors in the dry bean agrifood system has shifted over the last decade. Consolidation of canners has occurred in both the UK and US. Over the last ten years, the number of dry bean canners in the UK decreased from 18 to 3. A similar, but less dramatic trend occurred in the US.

### **3.3 Institutional Change: UK and US Canners' Standards**

According to a university researcher who has worked in the industry, a few of the most important quality specifications for UK and US canners are foreign matter content, damage, checked seed coats, contrasting classes, and color. Foreign matter includes dirt, glass, rock, and clay and is the biggest concern for food safety. Checked seed coats (broken bean skins) and damage are important factors that contribute to the integrity of the bean during the canning process and thus, they are important factors in the appearance quality. Contrasting classes and color are also important for appearance. Contrasting classes means the amount of a different class of dry beans in a load, i.e., the percentage of black beans allowed in a load of navy beans. The color of the bean can also be an indicator of flavor (off colored beans can be a signal of off flavor beans). Michigan public standards<sup>6</sup> allow a maximum of 0.2% of foreign material in its number one grade of navy beans<sup>7</sup>. The maximum allowance for total defects is 2% while the allowance for contrasting classes is 0.1%. Michigan number one navy beans must have good<sup>8</sup> color.

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<sup>6</sup> In the 1930s, Michigan dry bean growers and shippers/elevators worked together to differentiate Michigan dry beans by establishing standards above the federal standards through Michigan Regulation 523.

<sup>7</sup> This discussion will focus on the Michigan public grades and standards for navy beans because of the importance of navy beans to Michigan and the UK.

<sup>8</sup> What is considered good color is defined every year by the grades committee of the Michigan Bean Shippers Association. Color is a quality factor that is highly dependent on the weather conditions during the growing season. Thus, the grades committee considers the average color of the crop, which is dependent on weather conditions, when determining good color.

According to industry key informants, until the 1990s dry bean UK and US canners purchased dry beans based on the Michigan public standards. However, in the early 1990s the canners began to respond to changing consumer preferences and their increased power by setting their own firm specific standards for the dry beans they purchased. Thus, increasingly the canners began to buy beans based on their own firm specific standards rather than the Michigan public standards.

Specifically, UK and US canners' tolerances of foreign matter decreased and they began to set their own standards for foreign matter content to be stricter than the Michigan public standards. Canners began to demand practically a zero tolerance for contrasting classes. Checked seed coats (broken skin) are a primary factor in canners' standards, however, they are not even a factor in the Michigan public standards. Thus, the basis of trade changed from publicly set standards (institutions) to privately set standards (institutions) and thus institutional change occurred due to changes in consumer preferences and changes in the power structure of the system.

### **3.4 Changes in relative prices**

When institutions change, relative prices, and what is considered a cost and to whom, change. Changes in UK and US canners' standards for dry beans induce changes in the implicit and explicit relative prices (payoffs) to production technologies and product choices in the Michigan dry bean industry. For example, most UK and US canners now require that all navy beans they purchase must be "eyed", which means they have been sorted by an electronic eye. An electronic eye is a machine that sorts beans based on color removing contrasting classes, like black beans, and also navy beans that are off color (i.e., not white enough). Thus, "eyeing" has become a standard for navy beans and changed the cost structure for elevators to provide navy beans.

### **3.5 Induced technical innovation**

Changes in relative prices resulting from changes in standards of UK and US canners induced technological innovation in the Michigan elevator industry. According to industry sources, elevators in Michigan have adopted capital equipment that embodies new technologies in order to meet the standards of canners. Cleaning and processing machinery, like electronic eyes, magnets, and metal detectors, has become standard equipment in most modern elevators.

The machinery is needed for the elevators to meet the canners' stricter standards for foreign matter, contrasting classes, and damaged beans. Electronic eyes are machines that sort by color, which allow the elevator to remove contrasting classes and damaged beans. Newer infrared electronic eyes not only sort by color, but can also detect and remove foreign material like glass, stones, clay and dirt. Magnets and metal detectors are both used to remove foreign material that is metal based like wire, nails, or other metal debris.

### **3.6 Induced Organizational and Structural Change**

#### **3.6.1 Organizational Change**

Faced with changes in relative prices due to the change in standards (institutional change), canners in the U.K. and the U.S. began to adjust their relationships with elevators (suppliers). Hence a change in the organization, i.e. coordination, between actors in the dry bean agrifood chain occurred. Two strategies, although not necessarily mutually exclusive, have emerged in order for canners to ensure they are practicing due diligence. Both are characterized by increased vertical coordination between canners and elevators. First, the canners have passed the cost of meeting the higher standards back to the elevators by stating in the purchase contract that the standards be met. This is usually accomplished by requiring the elevator to follow a quality assurance scheme. Some canners require a formal program, like HACCP or ISO 9000, that is certified by an accredited third party. However, some canners only require that the elevator have a quality assurance program that documents the bean handling procedures at the critical control points, but is not accredited by an third party.

Second, canners have begun entering in strategic alliances with elevators in order to ensure the standards are met. Sporleder (1992) defines strategic alliances as a vertical coordination mechanism between vertical integration and spot market transactions in which an upstream firm and a downstream firm are joint stakeholders in the outcome of strategic behavior. Canners want to reduce the monitoring cost of their inputs so they enter into agreements with one or two elevators. For example, a large U.S. canner has a contract with one elevator to be the sole supplier of certain classes of dry beans for the company. In another case, a canner in the U.S. contracts with an elevator to supply a certain class of beans for the canner to process for a large fast food chain. By building an alliance with one supplier, or a limited number of suppliers, the canners reduce their monitoring cost and build the trust relationships necessary to provide a high quality, safe end product.

#### **3.6.2 Structural change in the Michigan elevator industry**

Technological changes in initial processing equipment and organizational changes in the Michigan dry bean elevator industry led to structural change of the Michigan elevator industry. Specifically, the Michigan elevator industry has undergone rapid consolidation due to economies of scale. Large firms have an advantage when economies of scale exist because the unit or average cost falls as more units are produced. Hobbs and Kerr (1992) note that larger firms will be actively involved in purchasing smaller firms if economies of scale are evidenced due to additional equipment or increased paper work requirements (from quality assurance programs).

The elevator capacity in Michigan has remained fairly constant, however, there are fewer elevators (firms) and some have centralized/specialized processing (Kelly, 1992). Specifically, new processing equipment, quality assurance schemes, and storage and processing capacity all exhibit economies of scale and thus have led to the increased consolidation in the industry. Elevators have increased their capacity in order to spread the cost of these processes over more units of production. For example, according to an industry key informant, the cost of an



electronic eye can range from about \$35,000 for a basic model that sorts by color up to \$500,000 for a new infrared model that sorts both color and foreign material.

### **3.7 Institutional change in the Michigan dry bean sector**

According to industry key informants, shippers/elevators began to question the relevance of the Michigan public standards<sup>9</sup> in the 1990s as processors began to move from buying based on public standards to setting their own private standards. Shippers/elevators began to view the Michigan public standards as a competitive disadvantage rather than an advantage because they had to pay for certification that was becoming irrelevant.

The elevators began to change the standards (institutional change) on which they purchased dry beans from farmers. They began to buy beans based on their own standards, which were dictated by the UK and US canners' standards, rather than on the Michigan public standards. This includes buying based on factors not covered by the Michigan standards and paying premiums for exceeding the Michigan standards on some factors. For example, checked seed coats (broken skins) are an important factor to canners, but is not included in the Michigan standards. Most elevators set a five to seven percent allowance for checked seed coats and discount the price by \$1 to \$2 per hundred weight for going over the allowance. Additionally, some elevators pay price premiums to farmers who exceed the Michigan standards for factors such as foreign material. The Michigan standards allow 0.2% foreign material and some elevators pay a price premium for loads with less than 0.2% foreign material.

Thus, the Michigan public standards had become an unnecessary transaction cost because the canners were no longer buying based on it, but the elevators were still required to obtain it. With fewer firms in the Michigan dry bean elevator/shipper industry it became easier for them to organize themselves to change these standards (Olson, 1965). The elevators lobbied the Michigan Department of Agriculture to change these publicly set standards so that they would correlate with the standards that had evolved in the industry. In 1998, the regulation was amended making Michigan certification voluntary. This provided a cost savings for Michigan elevators because they were no longer required to obtain Michigan certification on all shipments.

This is an excellent example of how a publicly set standard did not change as market forces (changing consumers, changing organizational structure, changing technology, and changing industrial structure) changed and thus, became irrelevant as industry standards were erected to deal with the changing market forces.

## **4. General conclusions and managerial implications for agrifood industries**

In conclusion, a change in FAS (institutional change) can induce innovation effects (technological, organizational, structural, and institutional) through different levels of the agrifood chain, from consumers to canners to elevators to farmers, as well as across borders, the US and UK. As the forces of industrialization and globalization become increasingly complex and intertwined, managers must be aware of how institutional change, specifically changes in

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<sup>9</sup> Michigan Regulation 523 was enacted in the 1930s in order to differentiate Michigan dry beans by setting the state standards above the federal standards.

FAS, affect the “rules of the game” for their industry. This includes defining the good that is traded, who can participate in an industry, and the relationships among the actors.

Specifically, as the dry bean case illustrates, tighter vertical coordination between actors in the agrifood chain leads to the use of privately set standards rather than publicly set standards. As agrifood firms attempt to differentiate their products to meet the needs and demands of consumers, FAS will likely change and thus lead to increased coordination between the firm and its suppliers. Thus, managers of firms, both at the intermediate (assembly/initial processing) and processing levels, should note potential strategies include the use of specific contracts and strategic alliances. Managers of intermediate level firms should specifically take note that the induced technological and organizational change often leads to consolidation (structural change) in order to take advantage of economies of scale.

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