Country of Origin Labeling: Econometric Evaluation of the New Rule

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ABSTRACT

In recent years, many agricultural products, namely beef and pork, have been subject to country of origin labeling (COOL) provisions at the retail level in the United States (U.S.). This has caused uproar from many participants in the meat industry due to the law's implications on trade. More recently, the U.S. has adopted revised COOL provisions that became effective in May of 2013. Canada and Mexico, the two most affected trading partners of the U.S., have claimed that these new rules are even more restrictive than the original ones and will do further damage to trade. This paper's purpose is to evaluate if this new rule is actually more restrictive on trade as proposed by Canada and Mexico. To accomplish this, I conduct an econometric analysis whereby I test if there was a structural break in imports to the U.S. from Canada after the implementation of the new rule. I find that there is no significant evidence of the new rule having an effect on the industry as of the end of October 2013.

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I. INTRODUCTION

The cattle and hog industries are two of the largest agricultural industries in Canada based on farm cash receipts (Statistics Canada, 2013). In recent years, these two products, as well as many other agricultural products, have been subject to country of origin labeling (COOL) provisions when exporting to the United States (U.S.). Previously, these provisions have caused uproar from many participants in the meat industry due to the law's implications on trade. This issue has been dragging on for many years now and has even resulted in World Trade Organization (WTO) action against the U.S. More recently, the U.S. has adopted revised COOL provisions that became effective in May of 2013. Canada and Mexico, the two most affected trading partners of the U.S., have claimed that these new rules are even more restrictive than the original ones and will do further damage to the trade of cattle, hogs, beef, and pork.

The objective of this paper is to evaluate if this new rule is actually more restrictive on trade as proposed by Canada and Mexico. To accomplish this, I conduct an econometric analysis whereby I test if there was a structural break in exports to the U.S. from Canada after the implementation of the new rule.

The rest of this report is organized as follows. First, I provide a descriptive background of the COOL events and supplement it with details of the industry and the different interest groups involved. Next, I look into literature to give an insight on how COOL and other similar policies have been analyzed in the past. The fourth section describes my conceptual models as well as the data I will be using for the analysis. Then, I develop an econometric model to test for the COOL effect. Lastly, I follow up with a discussion of the results and a conclusion in the final section.

II. BACKGROUND

In 1930, the Tariff Act in the United States (U.S.) was established and section 304 required that every imported item clearly state its country of origin for the "ultimate purchaser". The U.S. Customs and Border Control determine the "ultimate purchaser" to be the last person in the U.S. to receive the item in the form it was imported (Greene & Jurenas, 2013). As a result, any product entering the U.S. which is not directed towards sale in its raw form, for example timber which is further processed, will only have to bear the label of origin until the processor obtains the item. Afterwards, if the processor is able to 'substantially transform' the product into another form, such as transforming timber into a bench, it can then send the product to retail without it having to bear its label of origin (Greene & Jurenas, 2013).

In addition to this, the Tariff Act allowed for exceptions to the origin labeling requirements for products known as J-list items. These J-list items consisted of agricultural products in their natural state such as vegetables, fruits, nuts, berries, live and dead animals, fish, and birds. The only provision for these products is that their "immediate container" must include origin labels (Greene & Jurenas, 2013). However, if these items are sold unpackaged when imported for direct retail, then identifying their country of origin is not necessary.

1. Introduction of Country of Origin Labeling

Ever since the near initiation of the 1930 Tariff Act, there have been farm and consumer groups which have demanded that the J-list "exceptions" be abolished so that consistent country of origin labeling is applied to all products. Their reasoning is two-fold: first, they believe consumers should know where the products they purchase come from and second, doing this will strengthen demand and prices for the U.S. farmers and ranchers (Greene & Jurenas, 2013).

As a result of the lobbying efforts by various interest groups that support COOL, the 2002 Farm Bill mandated that country of origin labeling be applied at the retail-level to fresh fruits and vegetables, beef, pork, lamb, seafood, and peanuts, effective September 30, 2004. Although the exact purpose of this rule sometimes gets confused, the intent described by the USDA in the proposed regulation is as follows:

> *"The intent of this law is to provide consumers with additional information on which to base their purchasing decisions. It is not a food safety or animal health measure. COOL is a retail labeling program and does not address food safety or animal health concerns. Food products, both imported and domestic, must meet the food safety standards of FSIS [Food Safety and Inspection Service] and/or the Food and Drug Administration (FDA), as applicable. In addition, all food products must also meet FDA labeling standards as well as other FDA regulations and standards"* (Ikenson, 2004).

2. The Canadian and US Cattle Industry

In the cattle industry, there are three basic stages. These include the producer (farm-level), the processor (packer or slaughter-level), and the retailer. The producer level is where the cattle (or calf) is born and raised in feedlots, the processor stage is where the animal is processed into some form of beef for retail, and the retail stage is where the consumer is able to purchase the product. Throughout the supply chain, cattle are typically identified in three different forms – feeder cattle, fed or slaughter-ready cattle, and beef. Feeder cattle are on the farm (also known as feedlot) and are being raised to become ready for slaughter. Fed or slaughter-ready cattle have been fed and raised to the appropriate weight and are now ready to be sent to the slaughterhouse for processing. Beef is the final product after slaughter has occurred and it is sent to the retailer or the purchaser.

Understanding the timeline of this industry is important for determining when production decisions might occur because these decisions will affect future imports and slaughter levels. Most often, beef calves are born in the spring so that they can feed on the new grown grass and so producers can avoid raising the calves through the harsh winter conditions (Explore Beef, 2013). For the beginning of most calves' lives they feed off their mother and graze grass in the pasture. Eventually at 6 – 10 months of age the calves are taken away from their mother, fed until they reach a larger weight, and then sent to the auction or background stage. Following the auction at 6 – 12 months or the background stage at 12 – 14 months of age, the cattle are shipped to the feedlots where they are raised to optimal weight and condition. Finally, at 18 – 22 months, they are sent for processing at the slaughter facility (Explore Beef, 2009).

3. Opponents and Proponents of COOL

Generally, the supporters of COOL have been U.S. farm producer organizations and consumer groups because they stand to gain the most welfare, or any welfare at all for that matter, from the implementation of the law (Anderson & Lusk, 2004). On the other hand, U.S. retailers, processors, and the Canadian cattle supply chain mostly oppose COOL because they believe that they are being adversely affected and there are no clear benefits arising from the provision.

The following chart gives a brief overview of some advocates and opponents of COOL:

ADVOCATE	OPPONENT
Ranchers-Cattleman's Action Legal Fund (R-CALF)	National Cattleman's Beef Association (NCBA)
US Cattleman's Association (USCA)	National Pork Producer's Council (NPPC)
National Consumer League (NCL)	American Meat Institute (AMI)
Consumer Federation of America (CFA)	North American Meat Association (NAMA)
	Canadian Cattleman's Association (CCA)
	Canadian Pork Council (CPC)

(National Consumers League, 2013), (Greene & Jurenas, 2013)

There have been various arguments on both sides of the issue. The advocates of COOL insist that U.S. consumers have the right to know where all of their food is coming from and, given the choice, consumers would prefer to purchase domestically. This would bring about an increase in domestic demand and prices for U.S. farmers and ranchers. Additionally, they believe that it is unfair to exempt some agricultural commodities while all others are subject to the origin labeling law under the Tariff Act of 1930 (Greene & Jurenas, 2013). Opponents have argued that there is little, if any, real evidence of consumers wanting to know, or even caring about, where the products they are consuming originate. They hold that as long as the products pass U.S. safety and health standards, which they do, consumers do not necessarily have a demand for origin labeling. As well, the costs involved to comply with COOL far exceed any combined potential benefits of producers and consumers. Even more, the opponents suggest that this is a form of protectionism that would undermine trade (Greene & Jurenas, 2013).

The continued debates of COOL up until the originally planned effective date of September 30, 2004, resulted in Congress to postpone the implementation until September 30, 2006 for all products except seafood. Following this, the implementation was again postponed two more years until September 30, 2008.

4. 2008 Implementation of COOL

The implementation of COOL in 2008 was a multi-step process. First, there was an interim rule put in place in September 2008 and then, to follow this up, the final rule was introduced and became effective on March 16, 2009. The final rule was not as strict as the interim rule and it essentially outlined four key provisions (Greene & Jurenas, 2013):

1. It applies to ground and muscle cuts of beef, lamb, and pork, farm-raised and wild fish and shellfish, peanuts, "perishable agricultural commodities" (e.g. fruits and vegetables), goat meat, chicken, pecans, macadamia nuts, and ginseng.
2. "Covered commodities" that have been 'substantially transformed' are exempt.
3. Only retailers with annual purchases greater than $230,000 of perishable agricultural commodities are required to inform consumers of origin "by means of a label, stamp, mark, placard, or other clear and visible sign on the covered commodity or on the package, display, holding unit, or bin containing the commodity at the final point of sale".
4. Food service establishments, also known as "the hotel and restaurant industry" (H.R.I.), are exempt from labeling requirements.

All products that are subject to the COOL provisions must be labeled at the retail level. When a product carries the COOL label it must be clearly stated on the package and it must abide the specific labeling rules. With this 2008 rule, there were four different labels a product could bear depending on where the product originated. The four different labels are as follows:

Table 1: COOL categories

Category A	Meat from animals born, raised, and slaughtered in the U.S. Labeled as a product of the U.S.
Category B	Meat from animals born in Canada, and raised and slaughtered in the U.S. Labeled product of U.S. and Canada.
Category C	Meat from animals born and raised in Canada, and slaughtered in the U.S. Labeled product of Canada and the U.S.
Category D	Meat imported into the United States.
	(Rude, et al., 2010)

If a product was inappropriately labeled because it did not follow the above guidelines, the responsible agents in the supply chain could be subject to a penalty.

5. COOL's Effect on the Industry

The intended end result of having country of origin labeling is to inform consumers about the origin of a product at the retail level. However, providing such a label is not as simple as just 'smacking on a label' before the product goes up for sale. Instead, it involves a multi-step process of record-keeping, tracking, and even segregating the covered product at the initial production phase and all along the supply chain until the retail phase.

Suppose that retail beef in the U.S. is only derived from cattle born, raised, and slaughtered in the U.S. At the producer level, the calf will be born and then raised until it has reached a specific weight and age for it to be slaughter-ready. The producer will then send its cattle to the slaughter house for processing. Along with sending the cattle, the producer must also send documentation that specifies the cattle's country of origin. Upon arrival at the slaughter house, the cattle will be processed into many forms of beef and then shipped for retail. Again, the required origin documentation must accompany the shipment of beef products. Finally, when the beef products arrive, the retailer will package (if not already pre-packaged), distribute, and appropriately label the supply based on the documentation that has been passed along the supply chain.

Described like this, the process appears to be fairly simple and should not require much compliance cost considering all products are of U.S. origin. However, if we consider the same process but allow for Canadian cattle and beef to be integrated into the system, complications arise. Now, the producer must keep record of both the Canadian and U.S. cattle in its feedlots. To do this, the producer must develop a method of segregating the cattle between origins in order to easily differentiate between them when it is time to ship the livestock to the processor. The processor must also be able to differentiate between the cattle so that it can quickly and appropriately label the beef when slaughtering. Now, after the processor has slaughtered many origins of beef, it must segregate the finished products so that upon reception, the retailer can easily differentiate between the origins in order to package and properly label the beef.

The supply chain which incorporates both U.S. and mixed origin cattle is definitely more costly for all agents since it requires more record-keeping and segregation costs than a supply chain that includes only U.S. cattle (Informa Economics, 2010 and VanSickle, 2003). One study, by Informa Economics (2010), finds that the retailer is subject to the most costs in the supply chain as retailers need to create a system to identify, label, segregate, and track through distribution and retail. This has resulted in many U.S. retailers electing to sell only U.S.-origin products in order to avoid the higher costs of meeting label specifications (Informa Economics, 2010). This adds a restriction on suppliers down the supply chain that deal with mixed origin products as they must now find retailers that will either accept mixed origin products, establish clients that use the products in ways that are not subject to the COOL laws, such as the hotel restaurant industry, or simply opt out of purchasing Canadian and foreign-born and raised cattle.

An alleviation to processors that use mixed origin products, which has been debated since the implementation of the final rule in 2009, is the 'commingling of meats' on production day. Basically, what this means is that U.S.-origin cattle that are processed alongside Canadian-born and US-raised cattle (but not Canadian-born and raised) are able to be labeled as category B. In addition, a label B can be used when processing both cattle that would carry a label C and cattle that would carry a label B (Rude, et al., 2010). This provides added flexibility to the processors when processing cattle and it enables them to avoid switch-over cleaning and maintenance when processing different origin livestock – costs which can be extremely significant when considering the lost production time due to switch-over. Overall, this allows them to reduce costs by operating with a more efficient production line.

The other relief for processors is set out in the provisions, as described previously. These include the lines of business which are not subject to the country of origin labeling rules such as the HRI, 'substantial transformed' products, and meat sold at a retailer that purchases less than $230,000 of perishable agricultural commodities annually. These clauses are important because they may cause processors to alter their behaviour by attempting to develop relationships with these industries in order to avoid the labeling restrictions when operating.

6. Industry lobbies for WTO action

Even before the final COOL rule went into effect in 2009, Canada and Mexico were concerned about its implications on their livestock sectors (Greene & Jurenas, 2013). Initially, Canada and Mexico tried to negotiate with the U.S. about modifying the COOL provisions; however, the negotiations did not result in any progress. In turn, Canada and Mexico appealed to the World Trade Organization (WTO) to consider their case on the basis that the COOL provision was inconsistent with the U.S.'s obligations under the WTO agreements.

On November 18, 2011, the WTO Dispute Settlement Panel (DSP) ruled that certain COOL requirements were in violation of the following agreements set out by the WTO:

AGREEMENT	VIOLATION
Technical Barriers to Trade (TBT)	The COOL measure treated imported livestock less favourably than "like domestic livestock", particularly in the labeling of muscle cut meats (beef and pork). Violates the national treatment obligation in TBT's Article 2.1
Technical Barriers to Trade (TBT)	COOL failed to meet the legitimate objective of providing information to consumers on the origin of meat products. Violates TBT's article 2.2.
General Agreement on Tariffs and Trade 1994 (GATT 1994)	Vilsack's letter (a letter describing further recommended efforts for US agents to comply with on top of the stated COOL provisions) went beyond COOL's obligations and constitutes unreasonable administration of COOL. Violates Article X: 3(a) of GATT 1994.

(Greene & Jurenas, 2013)

The U.S. appealed the DSP decision to the WTO's Appellate Body (A.B.). The A.B. did establish some changes to the original DSP ruling but, overall, the ruling was upheld and the U.S. was required to modify its COOL rule in order to comply with its WTO obligations.

7. US RESPONSE AND NEW RULE

On March 12, 2013, the USDA published a proposed rule and followed it up with a final rule that came into effect May 23, 2013. Essentially, this final rule was an amendment to the previous labeling provisions. The key modifications with this new rule are as follows:

"Under this final rule, origin designations for muscle cut covered commodities derived from animals slaughtered in the United States are required to specify the production steps of birth, raising, and slaughter of the animal from which the meat is derived that took place in each country listed on the origin designation. In addition, this rule eliminates the allowance for commingling of muscle cut covered commodities of different origins. These changes will provide consumers with more specific information about the origin of muscle cut covered commodities"

(USDA-AMS, 2013)

As an example of how a retailer is to appropriately label a product under this new rule, consider beef that was from cattle born in Canada, raised in the U.S., and slaughtered in the U.S. Here, the label on the package would be something along the lines of, "Born in Canada, Raised and Slaughtered in the U.S."

8. Aftermath of the Rule... So Far

Since the rule was established, Canada and Mexico have stated that they believe this rule violates U.S. obligations to the WTO even more than the previous rule because of its more strict labeling provisions. On June 7, 2013, the Canadian Minister of International Trade, Ed Fast, and the Canadian Minister of Agriculture, Gerry Ritz, stated the following in regards to COOL.

"Despite consistent rulings by the World Trade Organization, the U.S. government continues its unfair trade practices, which are severely damaging to Canadian industry and jobs. Our government is extremely disappointed that the United States continues to uphold this

protectionist policy, which the WTO has ruled to be unfair, and we call on the United States to abide by the WTO ruling" (Foreign Affairs, Trade and Development Canada, 2013).

As of the end of August 2013, Canada formally requested the WTO to form a compliance panel to evaluate the U.S. final rule (Ontario Farmer, 2013).

Recently, Tyson Food Inc., a major U.S. processor of Canadian cattle, has made the decision to stop processing Canadian fed cattle (CTV News, 2013). Tyson is the third-largest buyer of Canadian cattle. As a result, this action is expected to lead to a drop in prices for Canadian producers as there will be greater competition amongst producers (CTV News, 2013). Specifically, a Tyson spokesperson stated that, "unfortunately, we don't have enough warehousing capacity to accommodate the proliferation of products requiring different types of labels due to this regulation [COOL]" (CTV News, 2013).

III. LITERATURE REVIEW

Thus far, there have been multiple analyses with regards to the initial country of origin labeling rules that were planned out in 2002 and the final rule that was implemented in 2008. The various studies I review here are all staged in North America and can be divided between two streams of work. I organize this section into three parts – the first reviews previous simulation studies and the second considers previous applied econometric works on COOL. I then briefly discuss the debate of whether consumer benefits accrue due to the implementation of COOL.

1. Simulation Studies

All of the following studies attempt to achieve a common outcome – that is, to determine the effect of country of origin labeling on the welfare of the participants in the economy. Most of these studies use some variation of an equilibrium model. I will review these studies first, in chronological order, to give an idea how the models have developed as more information has become available. Then I review a study which incorporates estimates into a constant elasticity of demand model to evaluate COOL.

In the paper, "*Distribution Impacts of COOL in the U.S. Meat Industry*" by Atwood, et al., (2004) it is estimated how the implementation of COOL will bring about both short- and long-term changes to equilibrium prices and quantities for meat and livestock in the beef, pork, and poultry sectors. To conduct this analysis, they assume the economy can be represented by several beef, pork, and poultry sector structural supply and demand equations. These equations consist of factors that influence the supply or demand of a specific quantity. Following this, they totally differentiate each equation to retrieve a series of equations which determine the quantity changes for a given price (cost) change and elasticity – it is these equations which make up an equilibrium displacement model. The researchers calibrate this model using cost estimates of COOL from Sparks Companies Inc. (2003). They also obtain elasticity estimates from various literature sources in order to determine their own elasticity estimates using Monte Carlo simulation (Atwood, et al., 2004). After calibrating the model, they are able to estimate the gains and losses in surplus as a result of COOL. The results of this model are theoretically consistent with the fact that the costs of COOL lead to a reduction in retail supply and demand. In addition, when there is assumed to be no effect on consumer demand as a result of the policy, there are producer surplus decreases at all levels of the beef and pork industries (Atwood, et al., 2004).

Much like Atwood, et al. (2004), Anderson and Lusk (2004) use an equilibrium displacement model to consider both the vertical and horizontal relationships that exist across the livestock industry. In this study, they formulate their displacement model somewhat differently but also attempt to achieve the same end by computing the changes in welfare. For cost estimates, they use a high estimate from VanSickle, et al., (2003) and a low estimate from Sparks Companies Inc. (2003). Another important difference from Atwood, et al., (2004) is that they consider four different possibilities on how the cost incidence will be divided along the supply chain. In doing this, they find that the agents are affected differently depending on how the costs are spread along the supply chain and that overall, there is always a decrease in aggregate welfare (Anderson & Lusk, 2004).

Rude, et al. (2006) conduct a very similar study to Lusk and Anderson (2004) by attempting to trace the costs of COOL along the hog and pork supply chain. They use a partial equilibrium non-spatial model consisting of 16 equations and 16 endogenous variables. Their price and quantity data are retrieved from Statistics Canada, Agriculture and Agri-Food Canada's (AAFC) Livestock Market Review, and the USDA's Red Meat Yearbook. Like Lusk and Anderson (2004), they suggest four different scenarios which could affect trade patterns as a result of COOL. Overall, they determine that each scenario will have a different impact on how the costs are spread along the supply chain. They also determine that the largest impact of COOL would have occurred on the Canadian side of the border and that the welfare implications of the study hold up under different scenarios.

Another variation of the same sort of study is the Jones, et al., (2009) analysis of COOL using a Global Static General Equilibrium Model (STAGEM). For this model, they determine the different supply and demand equations for the representative household, the producer, and the supply chain in between, and also account for multilateral trade flows and other factors. Then, using an equivalent variation technique they are able to measure changes in social welfare due to the introduction of COOL. This study obtains data primarily from the Global Trade Analysis Project (GTAP) database. This database includes 57 commodities and 101 regions. For the data, they subdivide the agricultural sector into 12 commodity aggregations, the food processing sector into 7 aggregations, and aggregate the remaining sectors into 18 non-agriculture sectors (Jones, et al., 2009). The cost estimates are acquired from the USDA Agricultural Marketing Service (AMS). Using this data, they appropriately calibrate the model and evaluate the effects on the prices, quantities, exports, and imports. This study observes mixed results for imports, increases in prices, decreases in production and trade, and a global and U.S. net welfare loss as a result of COOL (Jones, et al., 2009).

Moss, et al., (2005) evaluate the impact of mandatory country of origin labeling (MCOOL) on economic surplus using a constant elasticity demand model. To do this, researchers begin with a simple market equilibrium that equates the domestic and import supply of beef with the total supply of beef. In turn, this total supply of beef also equates with the domestic demand for beef. With this, they modify the model to incorporate transaction costs of labeling, a demand shift representing the consumers' benefits from COOL, and another element which accounts for the reduced probability of acquiring contaminated beef, from events like Bovine Spongiform Encephalopathy (BSE), also known as Mad Cow disease, in the domestic supply. A key part to their theoretical framework is accounting for uncertainty by using a model proposed by Oi (1973) and adapted them. This uncertainty model considers a utility function where consumers can purchase insurance in order to reduce the probability of obtaining a defective product. Then, relating this to COOL, Moss, et al., (2005) suggest using this model to represent how consumers can differentiate between choosing a domestic versus foreign product. Following this, they incorporate this framework into a Constant Elasticity of Demand Model and then invert it.

$$q_T = D(q) = \left[\frac{1}{a_T} p\right]^{\frac{1}{\beta_T}}$$

Where q_T and p are the quantity and price, a_T is the scaling parameter, and $\frac{1}{\beta_T}$ is the price elasticity of demand.

The researchers then parameterize this model with estimated supply and demand elasticities from Atwood, et al., (2004) and retrieve price and quantity data on cattle from the USDA to empirically evaluate the labeling cost, the benefits to consumers, and the reduced probability of defect from the implementation of COOL. This method enables them to calculate the economic surplus before and after incorporating the COOL labeling cost, as well as the other factors. Additionally, Moss, et al., (2005) determine the labeling cost while simultaneously determining the shifts in supply and consumer demand that leave economic welfare unchanged which they consider to be the break-even labeling cost. They conclude that if the labeling cost is above this break-even cost then societal welfare would decline.

2. Applied Econometric Studies

This set of empirical studies all serve the common purpose of determining the effect COOL has on the economy. In these studies, the point of focus mostly surrounds the effect of COOL on the supply and demand of livestock and retail products throughout the supply chain or the effect of COOL on the Canadian-United States price basis. All of these studies use econometric modeling to test for structural breaks in either the Canada-U.S. price differential or the quantities supplied and demanded by the industry through changes in the number of cattle on farms, being slaughtered, or being imported and exported. The first two studies analyze the effect of COOL on fish markets. The next four all evaluate if the implementation of COOL on cattle or hog markets resulted in a structural change in the Canadian-U.S. price basis or the imports to the United States from Canada.

Initially, when COOL was first passed in 2004, it applied only to fish and no other livestock. As a result, the first empirical analyses with actual price and quantity data of the U.S. COOL law focused on fish products since these were some of the only products with available data that were subject to COOL.

Wozniak (2010) and Jones, et al., (2009) both analyze how COOL influenced the markets for fish by testing for structural breaks between the periods before and after the COOL implementation. Wozniak (2010) evaluates the influences on consumer demands of precooked, uncooked fresh, and uncooked frozen salmon. He gathers "Neilson Homescan" panel data of U.S. random weight purchases of salmon from 1998 to 2006, and includes 63,284 different purchases of random weight salmon and weekly aggregated household purchases. He then employs a nonlinear Almost Ideal Demand System (AIDS) model to analyze demand changes in salmon after the COOL implementation. The purpose of using this AIDS model here is to give share equations of the three goods. With this, he tests for the structural stability using a series of Chow tests, rather than just one, because he believes that the structural break may occur gradually as retailers adapt to the legislation at different rates.

Jones, et al., (2009), on the other hand, conduct an empirical study on how COOL has affected fish and shellfish rather than just salmon. They retrieve data from the Global Trade Analysis Project (GTAP) database and estimate exports and imports with a vector autoregressive (VAR) (2) process. Furthermore, they test for structural change using the CUSUM statistic. Both studies, Wozniak (2010) and Jones, et al., (2009), do not find any significant evidence of structural change in the salmon consumption or fish trade after the implementation of COOL.

Schroeder, et al., (2009) and Schroeder, et al., (2011) present two related studies that evaluate the impacts of regulations or policies on the Canadian-U.S. price basis for fed cattle. In a study prior to the 2009 analysis, Schroeder and Ward (2006) state that the difference between the fed cattle cash price basis in Canada and the U.S. is a key factor affecting trade in fed cattle (Schroeder, et al., 2011). Therefore, both of these studies are premised on the idea that if the regulation or trade-related policy affects the basis for fed cattle then there is reason to believe that there is an impact on the trade of fed cattle. I will begin describing how they undertook the first study and then build off it to introduce their next study.

In 2009, Schroeder, et al., attempted to determine the factors affecting the fed cattle basis between Canada and the U.S. and also determine the effect of government policy changes (one being COOL) on the price basis since the 2003 Canadian border closure due to BSE. As a bit of a background, the fed cattle price basis is the Canadian price minus the U.S. price (in Canadian dollars). As the U.S.

price increases relative to the Canadian price, the basis narrows. With that being said, the researchers used weekly data from January 1998 to June 2009 for both the Alberta-Nebraska and Ontario-Nebraska fed steer price basis. For the study, the Canadian prices were retrieved from CanFax and the Nebraska prices were from the USDA (Schroeder, et al., 2009). In conducting this analysis, they identified three distinct periods in the data (pre border closure, recovery, and post recovery) and found that the post-recovery basis did not return to pre-closure basis levels when the border re-opened. They suggested that this could be due to a number of market factors and determined six policy changes over the period as possible candidates. Initially, they tested each policy change with a t test but realized this did not provide clear evidence as to which factor was affecting the basis. As a solution, they specified and estimated a structural change model as a first-order, autoregressive process estimated by ordinary least squares which allowed for the measurement of policy changes independently from other market factors. This new model included the fed cattle price basis as the dependent variable and factors that affect market conditions and transaction characteristics as independent variables. Further to this, dummy variables for each government policy implementation were constructed. After running an econometric regression and obtaining results for the different policy changes, they find that the implementation of COOL had a negative effect on the price basis.

In a somewhat similar study, Schroeder, et al., (2011) conduct another analysis on the effect of trade-related policies on the Canadian-U.S. fed cattle transaction basis. What is different about this study is their method of data collection and modeling. Here, the researchers collect daily fed cattle sales data from seven different feedlots in Alberta over the period January 2006 to April 2009. Additionally, they obtain fuel prices from the U.S. Energy Information Center, regional federally inspected-steer and heifer slaughter in the U.S. from Livestock Marketing Information Center (LMIC), regional steer and heifer slaughter in Canada from CanFax, and weekly federally-inspected slaughter capacity utilization in Canada from CanFax (Schroeder, et al., 2011). For this analysis, they consider three policy changes which they believe affected the Alberta-U.S. price basis – the Specific Risk Material ban from all animal feed, the U.S. re-allowing exports of all Canadian beef following the BSE incident, and COOL. In their study, the researchers apply a model to estimate the impact of various transaction characteristics and market factors on the Alberta-U.S. fed cattle basis. Much similar to their 2009 study, they use the basis as the dependent variable and transaction characteristics and market conditions as independent variables. As well, they use dummy variables to represent each of the policy changes. Unlike their previous study, they include dummy variables for each day of the week to capture the within-week price patterns and for each month to account for seasonality. In conducting their procedure, they use a fixed effects estimator to control for the unobservable factors across the feedlots. Schroeder, et al., (2011) test and correct for other potential model problems such as endogeneity with the processing plant capacity utilization variable, serial correlation, and heteroskedasticity. In the end, this study establishes that we are able to determine if each policy had a positive or negative effect. In our case, they determine that COOL had a significant narrowing effect on the basis.

Rude, et al., (2010) take a different approach than most previous analyses of COOL by empirically examining if there was a structural change in the U.S. import demand for Canadian hog and pork products. To effectively do this, they attempted to isolate the impact of the COOL implementation from other factors which are believed to have affected trade flows. Data for this analysis was retrieved from various sources. Monthly data on hog and pork exports were collected from the Red Meat Market division of Agriculture and Agri-Food Canada (AAFC) for the period January 2000 to November 2009. They retrieved monthly average earnings in the U.S., from the U.S. Bureau of Labour Statistics, and Canada, from Statistics Canada, as the supply shifter for pork meat. Prices of corn and barley are obtained from the Market Analysis Group at AAFC as the supply shifters for hog production in Canada and the U.S., respectively. The demand shifter for pork meat in Canada is the seasonally adjusted labour income from Statistics Canada, while in the U.S. the demand shifter is the seasonally adjusted personal income from the U.S. Department of Commerce. In developing the model, the researchers only considered U.S. and Canadian hogs and pork for simplicity. They estimated reduced form import demand equations for feeder and fed hogs and pork meat as functions of the supply and demand shifters. A major obstacle with their analysis was determining if a structural break occurred at the end of the sample since they only had data for a short period after the COOL rule was implemented. To overcome this, they employed two different tests: the Bai and Perron (BP) procedure and the S-test from Andrews (2003). The BP procedure considers multiple structural changes and provides confidence intervals around the break dates. However, this test depends on a trimming factor which may not be set low enough to detect a COOL-induced structural change and, therefore, is not likely very powerful to determine end of sample structural changes (Rude, et al., 2010). The S-test on the other hand is valid under non-normal, heteroskedastic, and/or autocorrelated errors with potentially endogenous regressors (Rude, et al., 2010). This test fails to reject structural stability for feeder hog exports and pork meat but rejects that there is no structural change for slaughter hog exports in March 2008 (Rude, et al., 2010).

In their study, Pouliot and Sumner (2012) use an econometric model to evaluate the differential market impacts of COOL on cattle raised in Canada and exported to the U.S. This analysis considers price, quantity, and related data for the period September 2005 to December 2010 (chosen because this is the date the industry and market were no longer directly affected by the previous BSE provisions). The price data is the weekly average price basis for fed and feeder cattle in Alberta and Nebraska, obtained from CanFax. Their reasoning for using Alberta and Nebraska were because Alberta is the largest cattle exporting province in Canada and Nebraska is a central point in the U.S., it is a large producing site, and a common destination for Canadian cattle (Pouliot & Sumner, 2012). The quantity (or U.S. import) data was retrieved from CanFax whereas the weekly slaughter of cattle and placement of feeders in the U.S. was obtained from LMIC. For the econometric analysis, Pouliot and Sumner (2012) applied the price basis as the dependent variable for their first regression and the weekly ratio of imports of fed cattle to the slaughter of U.S.-born cattle as the dependent variable in the second regression. The price basis is used to determine the effects of COOL on the changing cattle prices in the U.S. and Canada whereas the purpose of the import-to-slaughter ratio is to examine the differential market effects of COOL on quantities (Pouliot & Sumner, 2012). Overall, if COOL had a significant, negative impact on the relative demand for Canadian livestock by U.S. firms, we expect a widening basis and/or reductions in the relative quantities of animals shipped to the U.S. (Pouliot & Sumner, 2012). In theory, the researchers suggest that the magnitude of the COOL impacts on prices and quantities will depend on the size of the Canadian export elasticity of supply. Furthermore, they suggest that the export elasticity of supply for fed cattle should be less than that of feeder cattle so that we should expect COOL to have a strong effect on the price in the fed cattle market and on the import ratio in the feeder cattle market. Pouliot and Sumner (2012) conclude that their results are consistent with their theoretical expectations.

3. Consumer Demand Analysis

Although I never go into detail about the potential consumer benefits that could accumulate as a result of introducing COOL, it is worth mentioning that one finds that there are mixed beliefs on the benefits of COOL in the existing literature. What is definite so far is that there has yet to be any study with significant evidence that shows COOL to have a significant effect on consumer demand.

Tonsor, et al., (2012) find that demand for covered meat products has not been impacted by the COOL implementation and, in addition, although consumers appear to prefer labels of origin they often valuate different origin labels the same. As an example, consumers revealed that they approximately attribute equal value for meat products labeled “Product of North America” and products carrying the label “Product of United States” (Tonsor, et al., 2012). In a contrasting study, Loureiro and Umberger (2003) conducted a survey whereby they determined that consumers were willing to pay a premium on products carrying the country of origin label. This survey was conducted at several grocery stores in Boulder, Denver, and Fort Collins, Colorado.

4. Literature Review Summary

Overall, the previous COOL impact studies have shown, for the most part, that the 2008 Country of Origin Labeling rule appears to have a negative impact on total economic welfare when considering that labeling products does not bring about additional benefits to consumers.

It is now just under six months after the amendments of the labeling provisions and a new country of origin labeling final rule being established. As mentioned previously, there have been many different interest groups stating that this new rule is even more restrictive than the 2008 COOL provisions and, as a result, it will have further implications on trade. However, even with all of these critiques on the new rule, to my knowledge there has yet to be a published study regarding the new rule's impact on economic welfare aside from the USDA cost estimates which is published in the Federal Register (USDA-AMS, 2013).

In what follows, I will conduct a study that tests whether the new COOL law had an impact on the live fed cattle exports to the U.S. from Canada. The purpose here is to understand if the new rule is actually more damaging to trade than the previous rule in that it treats imported livestock less favourably than "like domestic livestock". To evaluate the impact, I conduct an econometric analysis which tests whether a structural break occurred when the new labeling law took effect.

IV. THEORETICAL FRAMEWORK

To develop this model, I consider how a simple Canadian fed cattle export supply curve would operate in conjunction with the U.S. fed cattle import demand. This allows us to understand the key forces behind the level of exports to the U.S.

First, let's consider the Canadian fed cattle export supply curve. I included four relevant variables which should influence Canadian feedlots' supply of cattle to the U.S. for slaughter. These variables can be viewed in the following model:

$$EX.S_{CAN}^{Fed} = f(input\ prices, transport\ cost, Canada\ demand, U.S.slaughter\ demand)$$

A major driver in the decision to keep cattle until they are slaughter-ready has to do with the cost of the inputs. The major input for cattle in Alberta, where most major Canadian feedlots exist, is barley for feed. When the price of barley is high, I expect Canadian feedlots will be less willing to finish the cattle to be slaughter-ready as they will face higher cost curves. As a result, I expect that when the price of barley is high, export levels of fed cattle will decline in the future. It is difficult to determine at what time the barley prices will affect the fed cattle export supply decision so I have thought of four different stages this may occur. The first is the time of breeding where the producers' breeding decision is influenced by the expected price of barley in nine months when it is time to raise the calf. Alternative thinking could suggest that the producer will use its entire breeding cattle in to produce the maximum amount of calves because the producer will only gain by having extra calves as he can either raise them if the input prices are favourable or immediately sell them after birth. With this reasoning, the decision that influences fed cattle exports into the U.S. would be established by what the prices were before the breeding stage – the stage when the producer decides on how many breeding cattle to hold. Another stage where the input prices may affect the future Canadian exports is the birth of the calves. Here, the producer has the option to raise the cattle in Canada or export the calves to the U.S. If the input prices in Canada are high, the producer may decide against raising the calves at home and instead export. The fourth stage of consideration occurs just prior to cattle entering the feedlot. It is likely that when the input prices in Canada are very high, Canadian feedlots will be less willing to feed cattle and, as a result, export. Although there is no evident lag on what to base the export decision, what matters for now is that these input prices are an influencing factor of the Canadian fed cattle export supply.

At first thought, I was going to include the price received for exporting cattle as a main factor that influences the supply curve. However, I omitted this variable for a number of reasons. One reason is that, although there may be flexibility for feedlots to hold cattle for a short period of time to wait for higher export prices, there will likely be large exporters which have pre-set contractual obligations that they must meet. Therefore, minor price basis fluctuations should not act as a large influence. Another factor could be that, even though a producer may expect the price to increase in the future, the expected price increase must be large enough to offset the extra holding costs incurred. Even more, the feedlots may want to ensure they sell their livestock at the optimal condition and, therefore, will not delay shipment in case the condition of their cattle changes. The reasons I have mentioned rely on the assumption that the price basis fluctuations between Canada and the U.S. does not move to an extreme whereby Canadian feedlots are motivated to export as much or as little livestock as possible because of very high or low U.S. prices. Lastly, by including price into the econometric model there is a chance of specification error as it would be unclear if the price introduces an endogeneity issue.

The cost to transport the cattle from Canada to the U.S. is another influencing factor on the supply decision. One possible thought, which may seem counter-intuitive, is that as the price of transport increases, the level of exports also increase. For this line of thinking, one would suggest that producers will try to send more cattle per load in order to achieve better economies of scale when transport costs are high. However, it is safe to assume that producers always attempt to be most cost efficient by transporting with maximum capacity. Therefore, as the cost of transportation increases, exports will decrease. Additionally, it is reasonable to propose that the costs of transport today will affect the slaughter levels in a couple of weeks.

I expect consumer demand in Canada and the demand by U.S. packing facilities to affect export levels. First, if consumer demand for beef in Canada is high then the demand for cattle by Canadian processors will be high. As a result, feedlot owners will be more likely to ship their cattle to Canadian processors than U.S. processors because they will receive a more desirable price for doing so. Conversely, when the U.S. slaughter demand is high, the export supply will likely increase since feedlots will receive a better price from U.S. processors.

In relation to the Canadian export supply, we have the U.S. fed cattle import demand which take the following form.

$$IM.D_{U.S.}^{Fed} = f(transport\ cost, US\ consumer\ demand, exchange\ rate)$$

Another major factor affecting the U.S. import demand is the U.S. consumer demand. This will be a two stage effect because the consumer demand should increase slaughter levels which should, in turn, increase the exports from Canada so there is enough supply to meet demand requirements.

I opted out of including the prices of the input fed cattle to determine the import demand. My reasoning here is that since Canada is a small fed cattle exporter to the U.S., we can assume it is a price taker. As a result, assuming homogeneous products between Canadian and U.S. fed cattle, once controlling for the import costs, the prices of U.S. and Canadian fed cattle will be equal. Therefore, the amount of imports will not be a function of the actual price of the fed cattle but rather a function of the import costs – which is essentially the cost to transport. This brings us to transportation costs which, like export supply, will result in greater imports when the cost of transport is low and less imports when it is high.

The exchange rate should also have an underlying effect on the transactions between Canada and the U.S. Using the rate in CAD/USD terms, we should expect an increase to result in greater imports as the U.S. will want to purchase more Canadian products since they will be relatively cheaper. Alternatively, if the rate appreciates for Canada, we would expect U.S. to demand less imports.

V. EMPIRICAL MODEL

The econometric model that I use for testing the effect of the new rule is related to the study conducted by Pouliot and Sumner (2012) and the study by Rude, et al. (2010). Here, I use weekly data to test the rule's effect on weekly imports as well as some similar explanatory variables. The model is specified as follows:

$$IM\_lag\_SL = \beta_0 + \beta_1 IM\_lag\_SL\_1 + \beta_2 INPUT\_"X" + \beta_3 FUEL + \beta_4 EX + \beta_5 UE + \beta_6 JAN + \cdots + \beta_{16} NOV + \beta_{17} HOL + \beta_{18} COOL\_08 + \beta_{19} COOL\_13$$

I use multiple explanatory variables as an attempt to isolate the effect of COOL from other factors. I will now break down each variable included in the model and explain why and how it was constructed based on the theoretical framework just described. I then discuss how I examined and adjusted the model to ensure it was robust. Note that each of these variables is defined in Appendix A.

The dependent variable is IM_lag_SL which is the log ratio of Canadian fed cattle imports to the U.S., lagged by two periods, to the U.S. total slaughter. Initially, I considered using only fed cattle imports but this was susceptible to erroneous conclusions. For instance, suppose that the imports from Canada decreased while at the same time the entire slaughter levels in the U.S. decreased. Looking only at import levels from Canada, we might conclude that the significant decrease in imports was due to a structural change which caused the U.S. to import less Canadian cattle. However, when we consider the ratio, we can separate the structural changes from cyclical changes in the U.S. and see that, even though Canadian imports decline in quantity, the ratio of Canadian fed cattle being processed in the U.S. did not. One drawback with this variable is that some believe that U.S. processors first process domestic cattle and then begin importing from Canada if they require more cattle to meet optimal slaughter capacities. Therefore, when the total slaughter in the U.S. decreases we might expect that the ratio of imports from Canada to decline too. I will ignore this possibility for now. I use a two-week lag for the imports in the ratio as an estimate of the time between when cattle are imported from Canada to the U.S. and are slaughtered. I also use the log for this variable and for every explanatory variable in the model, with the exception of the dummy variables, to determine the percentage change in the ratio, given a one percent change in an explanatory variable.

The first explanatory variable included in the model is IM_lag_SL_1 which is the lagged value of the dependent variable. Initially, this variable was included to help correct for serial correlation. The variable is justifiable under two assumptions. One assumption is that the ratio of imports to slaughter this period is a good indicator of what the ratio will be next period. The other is that some, if not many, firms operate on a contractual basis with the processors which last for many periods.

INPUT_"X" is the log ratio of the nearby Chicago Mercantile Exchange (CME) corn futures price and the Lethbridge barley price, lagged by "X" number of periods. The rationale for using the ratio of these two prices has to do with the Canadian producers' decision to export their herd before it is slaughter-ready. The CME corn price represents the average price U.S. feedlots face as an input cost whereas the Lethbridge barley price characterizes Canadian's feed input costs. The ratio signifies the relative cost of production in the U.S. versus Canada. If the ratio of corn to barley increases, the relative cost of input in Canada will be lower and, therefore, Canadian feedlots will be more willing to accept more feeder cattle – as a result, exports are expected to increase in the future. Intuitively, this makes sense since if the price of corn increases, the U.S. will be less willing to import feeder cattle since it will be more costly to raise them. Likewise, if the price of barley increases, Canadian feedlots will want to raise fewer cattle. As mentioned in the theoretical section, I suggested four potential lags for this variable. I decided to run three different regressions corresponding to three of the four potential lags. The lags I used were 52 weeks as an approximate time of when cattle might enter the feedlot, 80 weeks to represent when cattle could have been born, and 116 weeks to represent when breeding could have occurred. Since at these time periods producers are likely to base their decisions on expected prices, it may be appropriate to use the futures prices at that time. I did not acquire access to historical future prices so instead I used the previous years' average price as a proxy for the historical expected future price.

As described earlier, transportation cost is an influencing factor on the import/export decision. Here, I use the average of the Rocky Mountain and weekly Midwest diesel prices as a proxy for the transportation cost, which is defined above as FUEL. I expect the ratio of import to slaughter to be inversely related to this variable. I also lagged this variable by two periods to capture the effect of when the transportation costs would have been incurred.

The EX variable is the lagged difference of the log of the CAD/USD exchange rate. When subjected to the Dickey-Fuller unit-root test, the logged exchange rate by itself appeared to have a unit root. By using the first difference of the exchange rate I was able to be more confident that the variable was stationary. It is expected that as this variable increases, the dependent variable will also increase.

To estimate the effects of the U.S. and Canadian consumer demands, I used a two period lag of the difference in the logged ratio of Canadian and U.S. unemployment rate. I use the unemployment rate here as a proxy for the state of each economy and consequently, the strength of the Canadian and U.S. consumer demands. I use a ratio to capture the demand differences between the two economies. An increase in the ratio would suggest the Canadian demand is weaker than the U.S. whereas a decrease in the ratio would indicate the opposite. That being said, when the ratio increases I would expect the exports to increase as less livestock would be required in Canada to satisfy the demand. I use a two period lag because I am assuming it takes approximately two weeks from the time the feedlot decides to send the cattle to a Canadian or U.S. processor to the time when slaughter occurs. The difference is also used here to avoid having a unit root in the regression model.

The rest of the model consists of dummy variables. The first eleven variables are all monthly dummies which are used to account for the seasonality in the cattle market. Typically, calves are born in the spring, raised for about six to ten months and sent to the feedlot, then sent for slaughter around 18 to 22 months (Explore Beef, 2013). Therefore, we should expect imports for slaughter to occur around late summer to early winter. This trend is somewhat evident in graphs A and B in Appendix D. The next dummy variable represents weeks with holidays since it is believed that such weeks have an effect on the export levels. Lastly, I include dummies to test if the country of origin labeling rules of 2008 and 2013 show any effect on the industry. For the 2008 rule, I let the dummy COOL_08 equal one for every period following the last week of September 2008 – the effective date of the rule and the one commonly used in literature. I also let the dummy COOL_13 equal one for every week following the effective date of the new rule. What I expect to see is the coefficient on the COOL_08 variable to be negative and, as well, if the new rule had an impact on the economy thus far, I expect the COOL_13 variable to have a negative coefficient too.

Before I arrived to the regression form described above, my initial form included the same variables except they did not have any lags or first differences. As well, I did not initially include a lagged dependent variable as an explanatory variable. Before running my initial model I tested all of the continuous independent and dependent variables for stationarity using the Dickey-Fuller Generalized Least Squares unit-root test. This led me to adjust both the exchange rate and the unemployment rate by including them into the model as their first difference form because they appeared to be non-stationary. After re-testing, the unemployment rate was still non-stationary so I dropped it from the model. Next, I tested the model for serial correlation using the Breusch-Godfrey test. This showed that the model contained very significant autocorrelation. The major modification to correct for this was introducing a lagged dependent variable. This decreased the autocorrelation significantly but there was still some evidence of it so I regressed the model using Newey-West standard errors to get unbiased estimators. Additionally, I found that the model contained heteroskedasticity. However, the Newey-West standard errors corrected for this as well. I did not test for endogeneity between the explanatory variables and the dependent variable but I do not believe it is necessary to do so for two reasons. The first is that there is no theoretical merit for the imports to cause any effect on the explanatory variables. Second, most of the explanatory variables are lagged, appear in first difference form, or are ratios. As a result, these forms should mitigate the effect of any potential endogeneity in the model. The results for some of the tests mentioned here can be found in Appendix C.

VI. DATA

The data I used was retrieved from various sources which can be found in Appendix A. All of the data was weekly except for the unemployment rates which were monthly. I used linear interpolation to put the unemployment rate on a weekly basis.

VII. RESULTS

Once conducting the analysis, many of the explanatory variables had the same results across all three models and some results were contradictory between models. The variables with common results among the models include the lagged dependent variable, the monthly dummies, except for April and October, the holiday dummy, and both country of origin labeling rules. I will begin by describing the model with the 52-week lagged ratio of input prices then briefly outline the key results of the other models.

Beginning with the lagged dependent variable, we can see from Table A in Appendix B that this is positively significant at the 10% level with the variable carrying a coefficient of 0.0576 and a t-value of 1.72. Again, this variable was included to represent the autoregressive process of imports into the U.S. This is reasonable since I assumed that many feedlots and processing facilities operate on a contractual basis. The positive significance suggests that the imports have persistence from one period to the next as suggested earlier.

Looking at the monthly dummy variables we can see that, as expected, the summer months (May to September) tend to be negative at a very high level of significance – above 5%. Not as clear are the results of the other months. The months from October to April appear to have mostly positive effects on imports except for January, which is negative. However, January and March are the only significant variables in this group of months and these are significant at a 1% level. Overall, although not completely clear, imports tend to fluctuate with seasonality as expected in the Theoretical Framework earlier. In addition to the months, the holiday dummy variable appears to increase imports. Upon close review, I realized that since I am using a ratio of imports to slaughter, where the imports are lagged two weeks, this holiday dummy variable is inherently positive. This is because the holiday week (which only has four working days) will only apply to the slaughter levels and not the imports, as the value used for imports in the ratio will be the value of imports two weeks ago – when there was no holiday.

The most important variables in the models for this analysis are the COOL_08 and COOL_13 variables as these are used to assess the impact of the labeling rules on imports from Canada. First, when considering the 2008 labeling rule, we know that many studies and interest groups claim that this labeling law had a strong negatively significant impact on trade. From the regression outputs in Tables A of Appendix B, we can see that with a coefficient of -0.133 and a t-value of -4.35, the regression results suggest that this rule had a very negative effect on the import to slaughter ratio.

Much less clear is the effect of the recent 2013 rule. As this rule went into effect, many different industry groups, governments, and interest groups all contended that this rule was going to damage cattle trade even further than the 2008 rule. From the analysis here, I do not find any significant evidence of this rule affecting the import ratios from Canada. In fact, the results show the opposite of what was expected. The results suggest that the 2013 labeling rule increased the import to slaughter ratio but, for each regression, the results are not significant at the 10% level. There are many plausible reasons this rule does not display any effect, or for that matter, a positive effect rather than a negative one. When the rule became effective in May, the USDA allowed a six month "educational" period whereby the industry was to comply but there would be no penalties issued for failing to properly comply – essentially, this rule did not force any industry player to abide any provisions until November of 2013. This suggests that many of the industry changes did not occur until near November and, as a result, the model should not have discovered any significant negative effects following the rule's implementation in May. This appears to be what is actually happening as represented by the Tyson Foods Inc. case described in the Background section. Even more, it is possible that Canadian feedlots increased their exports of slaughter-ready cattle during this educational period so they are not left with a large stock come November if the U.S. processors refuse to take on Canadian cattle. This would require the Canadian feedlots to ship some of their stock prior to it being slaughter-ready. Another reason for the absence of any effect is that contractual relationships between feedlots and processors may have resulted in smooth operations following the COOL 2013 effective date. An issue with this reason is that processors knew that a rule was to come into effect since the beginning of the year. It is, therefore, unlikely that processors would have engaged in long term contracts with Canadian feedlots given that they believed the rule would place costly restrictions on them come May. Another potential explanation is that, upon learning the rule would truly not be enforced until November, U.S. feedlots may have decreased shipments to processors in order to build up their breeding herd for the future in anticipation that processors will only be willing to accept U.S.-only cattle. As a result, the level of U.S. raised cattle slaughter will decrease during the educational period causing the ratio to increase slightly.

Other interesting results in the models are the effects of the input price ratios, the transportation cost, and the exchange rate. In this regression, all of these variables have coefficients which mirror my expected effects but these values are not significant.

The other two regression models, the 80-week and 116-week lag models have somewhat different results than the 52-week regression model. However, what are most important are the results for the 2008 and 2013 COOL rule dummy variables. In both models, like in the 52-week model, the 2008 COOL rule appears to have a negative coefficient and highly significant (being significant at the 1% level. This strongly suggests that the implementation of the 2008 COOL rule did have adverse effects on cattle imports into the U.S. from Canada. The COOL_13 variable in the 80-week and 116-week models also had positive but insignificant results like the 52-week model.

VIII. SUMMARY AND CONCLUSION

Since the 2008 Country of Origin Labeling law took effect, there have been oppositions to this rule by various interest groups and governments. As a result, this case appeared in front of the WTO who mandated that the U.S. change its labeling provisions to comply with its WTO obligations. This led the U.S. to modify the rule's labeling requirements since it believed this change would put the rule into compliance. However, many industry participants and interest groups contend that this new rule, which took effect in May 2013, was much more damaging to trade and was even further out of compliance with WTO obligations.

Previous literature studies have evaluated the effects of the COOL labeling laws of 2008 and have, for the most part, found that the rule places a negative effect on imports from Canada as well as many other effects. No study to my knowledge, except for the USDA cost estimates, have evaluated if this new COOL rule of 2013 has placed an even further negative effect on trade.

After developing a model which attempts to explain how the ratio of imports from Canada to total slaughter in the U.S. changes before and after the May 2013 labeling rule, I find that this new rule has not contributed a clear evident effect on trade thus far. I do offer many suggestions as to why there does not appear to be a significant effect such as the "educational period", the contractual relationships, and the unobserved effects by the U.S. feedlots.

Given that major processing companies such as Tyson Foods Inc. are changing their behaviour closer to the end of the educational period, further research can be done to evaluate this rule with the structural change occurring at the end of the educational period. This would require many more weeks of data past the end of the educational period to do a proper analysis.

APPENDEX A: DATA

VARIABLE	EXPLANATION	SOURCE
IM_lag_SL	Log Ratio of U.S. Fed Cattle Imports from Canada (lagged by two periods) to Total Slaughter of Cattle in the U.S.	(Agriculture and Agri-Food Canada, 2013)
IM_lag_SL_1	This is the IM_lag_SL variable lagged by one period.	(Agriculture and Agri-Food Canada, 2013)
INPUT_52	Log Ratio of the CME nearby Corn futures price and the Lethbridge Barley price. It is then lagged by 52 periods.	(Agriculture and Agri-Food Canada, 2013)
INPUT_80	Log Ratio of the CME nearby Corn futures price and the Lethbridge Barley price. It is then lagged by 80 periods.	(Agriculture and Agri-Food Canada, 2013)
INPUT_116	Log Ratio of the CME nearby Corn futures price and the Lethbridge Barley price. It is then lagged by 116 periods.	(Agriculture and Agri-Food Canada, 2013)
FUEL	The log of the average of weekly Rocky Mountain and weekly Midwest diesel prices.	(Energy Information Center, 2013)
EX_4	Difference in the Log CAD/USD Exchange Rate between periods. It is then lagged by four periods.	(Bank of Canada, 2013)
UE_4	Difference in the Log CAN/US Unemployment Rate between periods. It is then lagged by four periods	(Statistics Canada, 2013) (Bureau of Labor Statistics, 2013)
JAN	Monthly Dummy	
FEB	Monthly Dummy	
MAR	Monthly Dummy	
APR	Monthly Dummy	
MAY	Monthly Dummy	
JUN	Monthly Dummy	
JUL	Monthly Dummy	
AUG	Monthly Dummy	
SEP	Monthly Dummy	
OCT	Monthly Dummy	
NOV	Monthly Dummy	
HOL	Holiday Dummy	
COOL_08	Previous COOL Rule in 2008	
COOL_13	New COOL Rule in 2013	

APPENDIX B: REGRESSION TABLES

I have three different regression tables – one for each of the different lag values I used for the ratio of corn to barley.

TABLE A:

newey IM_lag_SL IM_lag_SL_1 INPUT_52 FUEL_2 EX_2 jan feb mar apr may june july aug sep oct nov holiday cool_08 cool_13, lag(5)

Regression with Newey-West standard errors maximum lag: 5					Number of obs = 327 F(18, 308) = 26.70 Prob > F = 0.0000	
IM_lag_SL	Coef.	N.W.Std. Err.	t	P>|t|	[95% Conf.	Interval]
IM_lag_SL_1	0.057552	0.0333808	1.72	0.086	-0.0081312	0.1232351
INPUT_52	-0.34967	0.1293978	-2.7	0.007	-0.6042811	-0.09505
FUEL_2	-0.08275	0.0714446	-1.16	0.248	-0.2233303	0.0578321
EX_2	0.165428	0.1387828	1.19	0.234	-0.1076547	0.4385101
jan	-0.3246	0.0780358	-4.16	0	-0.4781469	-0.1710456
feb	0.066592	0.0770816	0.86	0.388	-0.0850813	0.2182651
mar	0.197399	0.0670869	2.94	0.004	0.0653927	0.3294059
apr	0.064176	0.0571095	1.12	0.262	-0.0481978	0.1765506
may	-0.22283	0.0739578	-3.01	0.003	-0.3683545	-0.0773015
june	-0.41697	0.0764331	-5.46	0	-0.56737	-0.2665758
july	-0.49377	0.0773318	-6.39	0	-0.6459353	-0.3416044
aug	-0.46623	0.0627774	-7.43	0	-0.5897584	-0.3427046
sep	-0.22675	0.0660478	-3.43	0.001	-0.3567073	-0.0967835
oct	0.027235	0.0545922	0.5	0.618	-0.0801857	0.1346561
nov	0.070535	0.0599558	1.18	0.24	-0.0474401	0.1885093
holiday	0.247861	0.0642809	3.86	0	0.1213758	0.3743463
cool_08	-0.13306	0.0306156	-4.35	0	-0.1933068	-0.0728226
cool_13	0.047764	0.0417994	1.14	0.254	-0.0344843	0.1300126
_cons	-3.27135	0.1563103	-20.93	0	-3.578923	-2.96378

TABLE B:

newey IM_lag_SL IM_lag_SL_1 INPUT_80 FUEL_2 EX_2 jan feb mar apr may june july aug sep oct nov holiday cool_08 cool_13, lag(5)

Regression with Newey-West standard errors maximum lag: 5				Number of obs = 299 F(18, 308) = 22.47 Prob > F = 0.0000		
IM_lag_SL	Coef.	N.W.Std. Err.	t	P>|t|	[95% Conf.	Interval]
IM_lag_SL_1	0.064084	0.0344067	1.86	0.064	-0.0036443	0.1318128
INPUT_80	-0.00321	0.1196803	-0.03	0.979	-0.2387931	0.2323815
FUEL_2	-0.05697	0.077863	-0.73	0.465	-0.2102382	0.0963041
EX_2	0.20166	0.1547812	1.3	0.194	-0.1030222	0.5063427
jan	-0.3646	0.0890449	-4.09	0	-0.53988	-0.1893151
feb	0.039824	0.0846746	0.47	0.638	-0.1268558	0.2065035
mar	0.162292	0.0752388	2.16	0.032	0.0141868	0.3103977
apr	0.029779	0.0628214	0.47	0.636	-0.0938831	0.1534413
may	-0.26098	0.0784248	-3.33	0.001	-0.4153537	-0.1065998
june	-0.4363	0.0791318	-5.51	0	-0.5920721	-0.2805345
july	-0.51788	0.0832401	-6.22	0	-0.6817321	-0.3540203
aug	-0.47645	0.0685467	-6.95	0	-0.611384	-0.3415194
sep	-0.24709	0.0724	-3.41	0.001	-0.3896096	-0.1045749
oct	0.001635	0.0587573	0.03	0.978	-0.1140273	0.1172968
nov	0.079346	0.0620319	1.28	0.202	-0.042762	0.2014543
holiday	0.235852	0.0784988	3	0.003	0.0813296	0.3903752
cool_08	-0.13405	0.0305828	-4.38	0	-0.1942524	-0.0738495
cool_13	0.048704	0.0425632	1.14	0.253	-0.0350801	0.132489
_cons	-3.27906	0.1709037	-19.19	0	-3.615478	-2.942639

TABLE C:

newey IM_lag_SL IM_lag_SL_1 INPUT_116 FUEL_2 EX_2 jan feb mar apr may june july aug sep oct nov holiday cool_08 cool_13, lag(5)

Regression with Newey-West standard errors maximum lag: 5				Number of obs = 263 F(18, 308) = 23.75 Prob > F = 0.0000		
IM_lag_SL	Coef.	N.W.Std. Err.	t	P>|t|	[95% Conf.	Interval]
IM_lag_SL_1	0.065462	0.0360874	1.81	0.071	-0.0056208	0.1365442
INPUT_116	0.212838	0.1116001	1.91	0.058	-0.0069851	0.4326601
FUEL_2	0.03008	0.0768189	0.39	0.696	-0.1212325	0.181393
EX_2	0.294746	0.1639699	1.8	0.073	-0.0282316	0.6177227
jan	-0.45027	0.0834786	-5.39	0	-0.6147034	-0.2858422
feb	-0.01749	0.0877556	-0.2	0.842	-0.1903474	0.155363
mar	0.150695	0.0705861	2.13	0.034	0.0116594	0.2897312
apr	-0.01629	0.0655255	-0.25	0.804	-0.1453582	0.1127773
may	-0.3211	0.0817253	-3.93	0	-0.4820807	-0.1601264
june	-0.48318	0.0822413	-5.88	0	-0.6451699	-0.321183
july	-0.60315	0.0841545	-7.17	0	-0.7689161	-0.4373921
aug	-0.53702	0.068997	-7.78	0	-0.6729289	-0.4011174
sep	-0.273	0.0708893	-3.85	0	-0.4126288	-0.1333628
oct	-0.05735	0.0589252	-0.97	0.331	-0.173416	0.0587178
nov	0.074107	0.067197	1.1	0.271	-0.0582534	0.2064671
holiday	0.13502	0.0661817	2.04	0.042	0.0046593	0.2653799
cool_08	-0.13589	0.0308648	-4.4	0	-0.1966806	-0.0750897
cool_13	0.061261	0.041661	1.47	0.143	-0.0207998	0.1433222
_cons	-3.33326	0.1830835	-18.21	0	-3.693887	-2.972636

Note: The number of lags is set to 5 in each of these Newey-West regressions as suggested by Stock and Watson's rule of thumb (Stock & Watson, 2003).

APPENDIX C: DIAGNOSTIC TESTS

I. DICKEY-FULLER GENERALIZED LEAST SQUARES (DF-GLS) UNIT-ROOT TEST

DICKEY-FULLER GENERALIZED LEAST SQUARES (DF-GLS)											
NUMBER OF LAGS	IM_lag_5L	IM_lag_SL_1	INPUT_52	INPUT_80	INPUT_116	FUEL_2	EX_2	UE_2	1%	5%	10%
16	-1.89	-1.89	-1.71	n/a	n/a	-2.95	-1.77	0.03	-3.48	-2.82	-2.54
15	-2.07	-2.06	-1.71	-1.54	-1.53	-2.95	-1.87	-0.21	-3.48	-2.82	-2.54
14	-2.01	-2.00	-1.78	-1.68	-1.71	-2.91	-2.01	-0.39	-3.48	-2.83	-2.55
13	-2.05	-2.04	-1.86	-1.82	-1.78	-3.19	-2.18	-0.58	-3.48	-2.84	-2.55
12	-2.15	-2.12	-1.92	-1.82	-1.75	-3.00	-2.32	-0.74	-3.48	-2.84	-2.56
11	-2.31	-2.27	-2.05	-1.94	-1.82	-3.12	-2.61	-1.13	-3.48	-2.85	-2.56
10	-2.53	-2.48	-2.37	-2.23	-2.01	-3.01	-2.90	-1.41	-3.48	-2.85	-2.57
9	-2.71	-2.66	-2.48	-2.31	-2.10	-3.33	-3.16	-1.73	-3.48	-2.86	-2.57
8	-2.63	-2.58	-2.57	-2.43	-2.32	-3.29	-3.88	-2.19	-3.48	-2.86	-2.58
7	-2.83	-2.79	-2.61	-2.49	-2.27	-3.58	-5.07	-2.85	-3.48	-2.87	-2.58
6	-3.01	-2.95	-3.05	-2.98	-2.84	-4.11	-6.03	-3.26	-3.48	-2.87	-2.58
5	-3.46	-3.39	-3.46	-3.29	-3.41	-4.50	-7.22	-4.26	-3.48	-2.87	-2.59
4	-4.12	-4.00	-3.82	-3.69	-3.54	-4.79	-8.96	-5.30	-3.48	-2.88	-2.59
3	-4.91	-4.75	-4.25	-3.96	-3.66	-5.21	-11.86	-8.04	-3.48	-2.88	-2.59
2	-5.94	-5.71	-5.50	-4.99	-4.73	-6.95	-15.61	-11.31	-3.48	-2.89	-2.60
1	-8.20	-7.85	-7.10	-6.65	-6.02	-9.13	-21.03	-17.31	-3.48	-2.89	-2.60

The highlighted values in the table correspond to the suggested values to use based on the Schwartz Criterion.

The Dickey-Fuller GLS table above lists the test statistic for each variable in the regression and the corresponding critical values for a 1%, 5%, and 10% level of significance. The number of lags on the left hand side of the table is the different lags one could use to choose a test statistic. I choose the lag which was suggested by the Schwartz Criterion when the test was conducted. The test statistics I am considering are the ones highlighted in yellow. From the table we can see that all variables appear to be significant at the 5% level except for UE_2. I tested the unemployment rate with different lags and first differencing techniques and I always concluded that there was insufficient evidence to suggest UE_2 does not contain a unit root. As a result, I decided to drop this out of the regressions.

II. Breusch-Godfrey LM Test for autocorrelation

I test for autocorrelation in three different regressions. Each regression took the following form, where the INPUT_"X" variable corresponds to INPUT_52, INPUT_80, and INPUT_116.

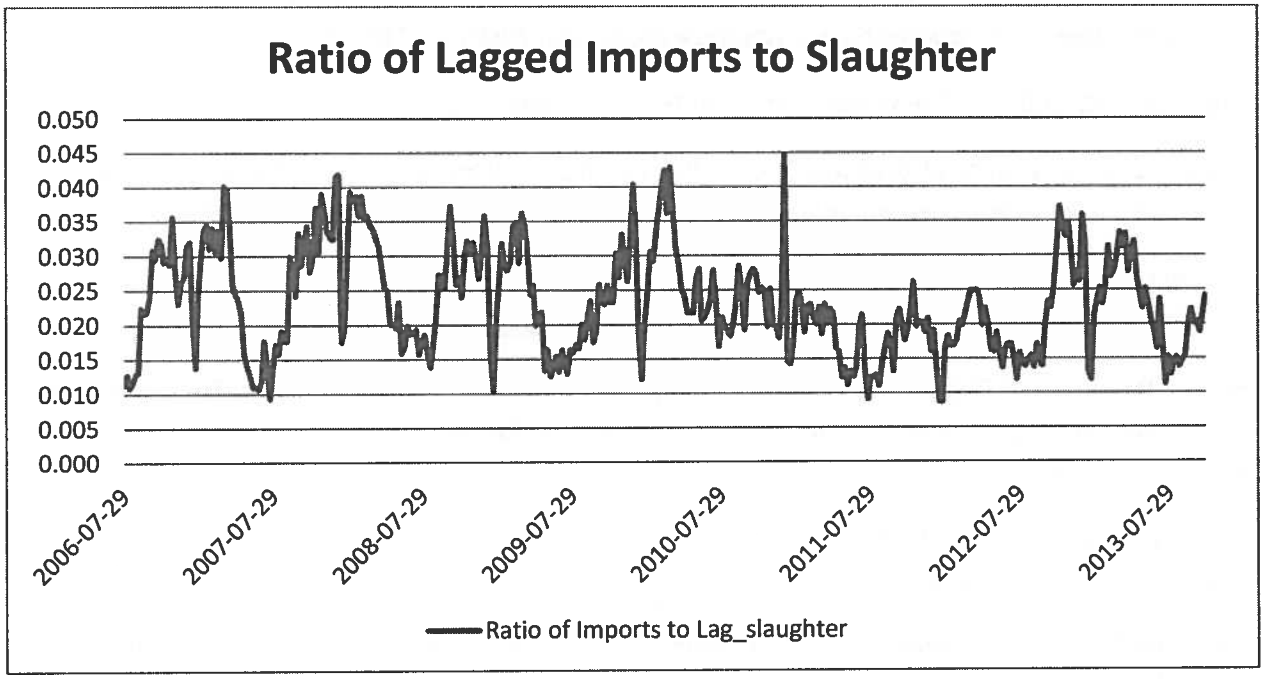
$$IM\_lag\_SL = \beta_0 + \beta_1 IM\_lag\_SL\_1 + \beta_2 INPUT\_"X" + \beta_3 FUEL + \beta_4 EX + \beta_5 UE + \beta_6 JAN + \cdots$$
$$+ \beta_{16} NOV + \beta_{17} HOL + \beta_{18} COOL\_08 + \beta_{19} COOL\_13$$

Regression	lags(p)	chi2	df	Prob > chi2
INPUT_52 Form	52	46.708	52	0.6814
INPUT_80 Form	52	38.513	52	0.9179
INPUT_116 Form	52	35.995	52	0.9555

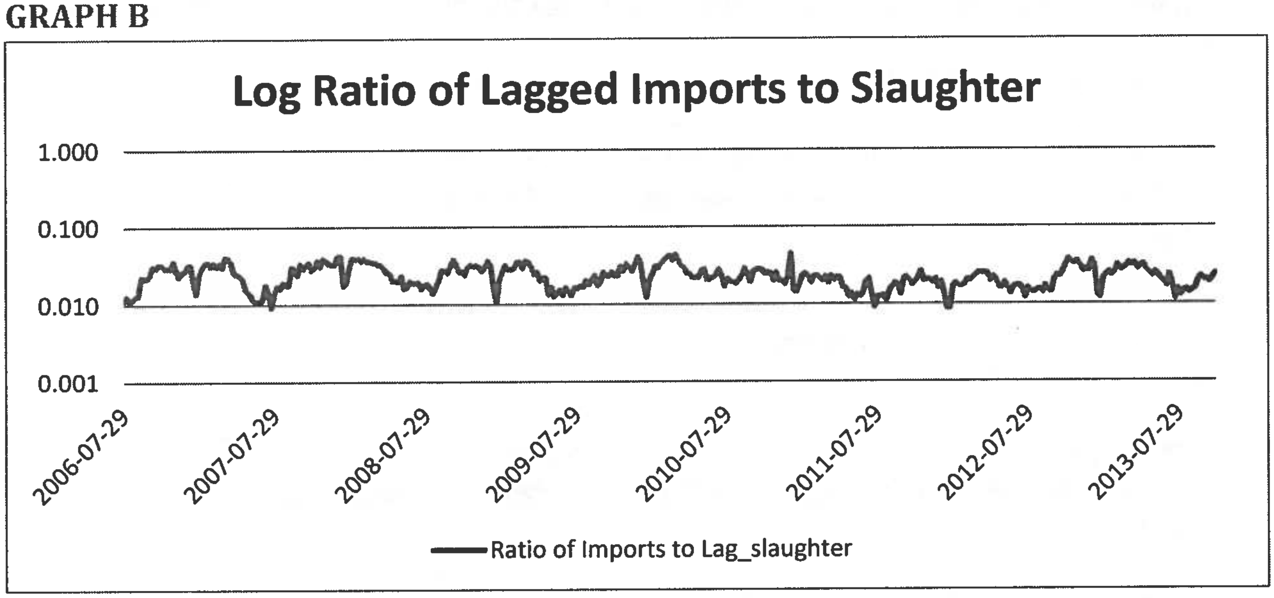
The null hypothesis here is that there is no serial correlation. Therefore, if the critical chi-square value is less than the test chi-square statistic, we conclude there is no evidence of serial correlation at a certain level of significance. We can see from the "Prob>chi2" column that it is very likely the model with INPUT_52 contains autocorrelation. The other two model forms, with the INPUT_80 and INPUT_116 variables, appear to not have significant evidence of serial correlation.

APPENDIX D: GRAPHS

GRAPH A



GRAPH B



Information for each graph retrieved from Agriculture and Agri-food Canada, (2013).

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