NAFTA RENEGOTIATIONS AND THE U.S. BEEF CATTLE INDUSTRY

Osei Yeboah, Ph.D.
Professor and Director
L. C. Cooper, Jr. International Trade Center;
Co-Coordinator, International Agricultural Development & Engagement Certificate Program
A-25 C.H. Moore Agricultural Research Facility
North Carolina A&T State University
Greensboro, NC 27411
336-285-4727 Office
336-334-7658 Fax
oyeboah@ncat.edu Email

Paula E. Faulkner, Ph.D.
Associate Professor
Department of Agribusiness,
Applied Economics and Agriscience Education
North Carolina A&T State University
1601 E. Market St Greensboro, NC 27411
pefaulkn@ncat.edu Email

Victor Ofori-Boadu
Analytic Consultant/President, Penuel Consult Inc.
598 Tillie Scott Court
Greensboro, NC 27455
336-601-3275 Phone
penuelconsult05@gmail.com Email

Theophilus Amoah
Graduate Research Assistant
Department of Agribusiness,
Applied Economics and Agriscience Education
L.C. Cooper International Trade Center
North Carolina A&T State University
1601 E. Market St Greensboro, NC 27411
tamoah@aggies.ncat.edu Email

Selected Paper prepared for presentation at the Southern Agricultural Economics Association (SAEA) Annual Meeting, Birmingham, Alabama, February 2-5, 2019

ABSTRACT

The misapprehension between the U.S., Mexico, and Canada as related to NAFTA took the wave of news since May 2017 especially with agriculture, which President Trump made clear is a priority. Mexico and Canada import up to $40 billion in agricultural products and inputs from the U.S. Conversely, the livestock sector depends on imports of live cattle from Mexico. This paper employs Computable General Equilibrium modeling to determine the impacts of the U.S. Cattle industry under the new NAFTA. Impacts are determined by the employment of a static specific factors model with competitive production that assumes constant returns, full employment, competitive pricing, and perfect labor mobility across industries. Substitution matrix made up of factor shares and industry shares are constructed. Factor shares are payments going to productive factors, and industry shares are the portions of factors employed by industry. The model uses labor data for four skilled groups (managers, professionals, service, production) across the manufacturing, services, rest of agriculture, and beef industries. Capital receives the residual of value added after the Labor and Energy Bill. The model can be readily simulated with various vectors of price changes in the livestock sector. Preliminary results indicate high prices for beef and lower output for the sector.

Keywords: **Computable General Equilibrium; Specific factors model, NAFTA, Factor Shares, Industry Shares.**

1.0.BACKGROUND

The United States (U.S.), Mexico and Canada have been in a misapprehension since May 2017 as related to the North American Free Trade Agreement (NAFTA) until November, 2018. Since the establishment of the trilateral trade agreement, there have been massive contributions for its members as goods and services move freely across borders. However, there have been ups and downs which make the overall measure of the economic impacts of NAFTA hard to measure as reported by Villareal & Fergusson (2017). This does not dispute the significance of the agreement as it set the pace for several foreign trade agreements (FTAs) that have added substantially to the U.S economy.

Despite the varied benefits of the trilateral agreement, the current White House has dubbed it as the worst trade agreement the U.S. has ever signed. President Trump believes this due to the estimated 700,000 loss of jobs to Mexico in 2015 (Economic Policy Institute). For instance, the manufacturers of Ford Motor Company cars announced to move their operations from Michigan to Mexico with the target of utilizing the cheap labor force in the country (Black, 2017). This move, and various others have; however, made prices of cars and other manufacturing products cheaper for the U.S. consumer.

In relation to Agriculture, which is the focus of this study, the Trump administration has made statements, declaring that it will stand up for those in the agricultural sector amidst his threat to exit the NAFTA. Mexico and Canada happen to be ranked on top when it comes to imports and exports of agricultural products (Hendrix, 2017). USDA reported that Mexico and Canada play very vital roles for the progress of agriculture in the U.S. as the two countries import up to $40 billion in agricultural products (Farm Credit Administration, 2018). Hendrix (2017) continues to establish that Mexico imported 28% of U.S. maize crop and the same purchases 33.3% of U.S.

beef exports. Steinberg (2018), with various researchers (Robinson & Thierfelder, 2018; Slaughter, 2018) have opined that there is a potential down-slope on agriculture in the U.S. in the case of termination of NAFTA. Johnson (2017) had already established that a renegotiation of NAFTA, if considered well, would improve agricultural market access, update NAFTA's provisions as with the sanitary and phytosanitary (SPS) measures that limit agricultural trade and address other trade concerns such as disputes among United States as far as agribusiness is concerned. It turns out that the administration chose to renegotiate the trade agreement which created the United State-Mexico-Canada agreement (USMCA) signed on November 30, 2018. It is easier to conclude that the decision to keep the North American Trade Agreement is a good idea, looking back on the benefits the trade agreement has yielded for the region. However, many are keen on knowing what changes President Trump insisted on and what effects they would yield. The present study predicts the potential impacts of USMCA on the U.S. Beef Industry.

1.1. U.S. Beef Industry under NAFTA with COOL

Agricultural trade has contributed tremendously to the U.S. economy as jobs are created and supported, investments are promoted, and economic growth is ensured. The USDA-ERS (2017) states that 8,000 jobs are created for every $1 billion in farm exports (page 5). In 2017, the Beef Industry reached a record of exporting 1.26 billion metric tons which was valued at $7.27 billion, a 15% increase from 2016 (U.S. Meat Export Federation, 2017b). Technically, this means; over 56,000 jobs were generated in the U.S. due to the Beef Industry. International trade plays a vital role in the U.S. Cattle Industry as it stands as the top meat export for the country. Beef exports increased steadily since the ratification of NAFTA, in 1994, from $300 million to $1.4 billion after a post-Bovine Spongiform Encephalopathy (BSE) rebound in 2008 (U.S. Meat Export Federation, 2017). However, the industry incurred some costs due to implementation of Mandatory Country of Origin Labeling (COOL) in 2002 when if first appeared in the Farm Security and Rural Investment Act of 2002 (2002 Farm Bill).

Debates arose amid the policy which required retailers to indicate the country of origin on affected commodities to inform consumers. While the proponents of the labeling claimed that it provides valuable information to consumers, opponents conversely suggested that it generates unnecessary cost for consumers and producers while affecting trade in affected commodities which includes beef. Most findings on the effects of the policy concluded that COOL/MCOOL is costly. Lusk and Anderson (2004) concluded that the implementation of MCOOL makes consumers worse of as the cost of the policy is push onto them. They further suggest that the producer welfare loss due to COOL is likely to be offset with enough increased aggregate demand of 2% and 3%. Conversely, the study conducted by Yeboah, Naanwaab, & Effraim (2016) concludes that an increased demand of 2% and 5% for pork and beef is insufficient to offset the cost associated with COOL. Also, Yeboah, Naanwaab and Otchere (2016) explicitly said that, "It poses financial burden on U.S. meat producers". In addition, a USDA-2015 report to Congress detailing the economic analysis of MCOOL revealed that the regulatory cost of the policy was 1.30% increase in farm supplies. It also showed that for processing, the cost was 2.10% each for domestic and imported manufacturing which was 4.2%. Another 2.10% for services and the Beef Industry saw a cost of 5.5%. Furthermore, other views stated emphatically that, COOL is not a wise policy to implement since it is costly and only informs U.S. citizens that 82% of beef consumed in the U.S. is totally produced in the U.S. whilst less than 75% of the citizens are willing to pay a premium for it (Plain & Grimes, 2003). Since it was implemented many views including that of Canada and Mexico have been against COOL since it poses a competitive disadvantage to their cattle producers (Bown & Brewster, 2017). The World Trade Organization (WTO) has sided with these countries and required the U.S. to repeal the labeling. The WTO estimates that the repeal of COOL would result in a 0.46% boost in upstream market share and for downstream, 0.31% points increase. Mexico is projected to see an increase of 0.52% points in upstream and 0.49% points market share increase in downstream.

1.2. Transition from NAFTA to USMCA with the Repeal of MCOOL

The current White House has currently succeeded in renegotiating NAFTA for USMCA which is yet to be ratified by congress. In the new agreement, the provisional change in the Beef industry is only the repeal of the MCOOL. This has already raised some concerns and debates among several stakeholders in the industry even amid the exhilaration for the non-tariff trade agreement. It is estimated that Canada and Mexico would see increased shares than what the WTO estimated in extreme cases due to information effect and change in relative prices (Hallren & Opanasets, 2018). Consumers who make purchase decisions using COOL will no longer have it and hence will see no difference in beef products which would affect the relative prices and propel market share gains for Canada and Mexico. Amid these benefits for the U.S. neighbors, Hallren & Opanasets (2018) settled that the impact of the repeal of COOL on the overall market price is so small and insignificant that the beef market expansion effect is negligible.

This present paper utilizes a Computable General Equilibrium Modeling with specific factors model of production and trade to predict the potential impacts of USMCA on the U.S. Beef sector.

1.3. Computable General Equilibrium Modeling Simulations

Various studies have reviewed the possible effects of trade agreement terminations over the years. Casting back, for instance, is the BREXIT which has had Ebell, Hurst & Warren (2016) and McGrattan & Waddle (2017), to mention a few studies among several that analyzed impacts of trade agreement termination on an economy by using different models in their studies. Outcomes from simulations of Multi-Country Neoclassical Growth Model which is a buildup on the multi-country dynamic general equilibrium model (McGrattan & Prescott, 2010, 2015) has made valuable forecasts related to the exit of the United Kingdom from the European Union (EU). Ebell et al. (2016) revealed that GDP for EU would decline through the export market share channel as part of other factors leading to the same outcome through the utilization of the National Institute's Global Econometric Model (NiGEM).

Steinberg (2018), Slaughter (2018), Robinson, and Thierfelder (2018), Ahmed (2018) and Hendrix (2017) among several other works of related literature have revealed a consistent outcome that shows that termination in the NAFTA would have had a negative impact on the U.S. economy with a more significant effect on agriculture. It is then a good position for the USA and especially the US agriculture sector to be as the Trump administration has succeeded in the yearlong negotiation to settle on the United States-Mexico-Canada Agreement (USMCA). These outcomes were extracted by several models. The Dynamic General Equilibrium Model revealed that while various other sectors would get hit, the agricultural sector which has high trade elasticity would particularly experience a significant drop in income (Steinberg, 2018). A similar view was revealed by the Global CGE Models reporting that even though there would be a modest macro impact on U.S. the agricultural sector would experience a significant impact upon the termination of NAFTA (Robinson & Thierfelder, 2018). This is to unveil a few. Furthermore, Hendrix (2017) particularly revealed that agriculture has experienced the most benefit from the trilateral agreement and is why the U.S. Secretary of Agriculture and other leaders in the U.S. fought hard to ensure that President Trump does not withdraw from NAFTA.

2.0.METHODOLOGY

The study employs the Computable General Equilibrium (CGE) model to determine impacts on the U.S. Beef Industry as NAFTA transitions to USMCA, especially with the repeal of the MCOOL Policy. The comparative model of competitive production and trade developed for instance by Chang (1979) and Jones & Scheinkman (1977) and is part of the foundation of trade theory. The model assumes constant returns, full employment, and competitive pricing. Each industry is assumed to have its own specific capital input in the present specific factors model with perfect mobility of labor and energy input across industries. Basically, the model simulates the effects of change made in NAFTA on factor prices and outputs. Further, the static specific factor model determines impacts on the Beef Industry. We assume competitive production, constant returns, full employment, competitive pricing, and perfect labor mobility across industries. The industries include manufacturing (M), service (S), rest of agriculture (A), and beef (B). Furthermore, the substitution matrix which inculcated the factor and industry shares was utilized.

2.1. Application of the Model

Employment of every factor (capital, labor, and energy) is represented by $v=Ax$ where v is the inputs vector, the matrix of cost-minimizing unit inputs is represented by A, and the output vector is x. We consider the supply of factors to be exogenous and perfectly inelastic fortifying $v=Ax$. Differentiating the full employment would result in $dv=xdA+Adx$. The substitution terms $S_{ik} = \sum_j x_j(\delta a_{ij}/\delta w_k)$ summarizes changes in unit inputs dA utilized by cost-minimizing firms when faced with changes in prices w_k. Every single input utilized is homogeneous of degree zero in factor prices and given homogeneity, they are independent of output. Further, we let the matrix substitution terms be represented by S hence, $dv=Sdw+Adx$. This is converted into elasticity form to make $v'=\sigma w'+\lambda x'$ (will mark this equation as (1)), where ′ represents percentage change, the matrix of cross-price input substitution elasticities $\sigma_{ik}=\sum_j \lambda_{ij} a_{ij}'/w_k'$ is represented by σ, and λ denotes the matrix of industry shares $\lambda_{ij}=a_{ij}x_j/v_i$. By this, the summation of rows of λ is 1 when there is full employment.

Considering competitive pricing, $p=A^T w$ is implied. The vector of output prices is p and w denote the factor price vector. We assume that the U.S. economy is a price taker in the beef market. $wdA^T=0$ is an enveloped condition implied by cost minimization which leads $dp=A^T dw$. Then again, converting this to elasticity form would be $p'=\theta^T w$ (let's mark this equation as (2)). θ being the matrix of factor shares $\theta_{ij}=\sum_i a_{ij} w_i/p_j$. Competitive pricing means the summation of the rows of θ^T is 1.

Bring (1) and (2) together would be,

$$\begin{bmatrix} \sigma & \lambda \\ \theta^T & 0 \end{bmatrix} \begin{bmatrix} w' \\ x' \end{bmatrix} = \begin{bmatrix} v' \\ p' \end{bmatrix} = \begin{bmatrix} 0 \\ p' \end{bmatrix}$$

Where: σ is a 9x9 matrix and is made up of aggregate price elasticities factor demand.

λ is a 5x4 matrix which details industry shares, and

θ^T represents a transposed matrix of factor shares which is dimensioned 4x5.

The vector w denotes endogenous factor prices, while x represents exogenous outputs. Exogenous factor endowment is represented by v and p is the exogenous world prices of goods facing the economy.

2.2.Factor Shares and Industry Shares

Table 1 presents the factor payments in each industry for 2017. The U.S. Bureau of Labor Statistics (BLS, www.bls.gov, 2017), U.S. Census Bureau and U.S. Department of Agriculture (USDA, www.usda.gov, 2017) are the sources of data for employment and labor payments in the manufacturing, service and agriculture industries. Sectoral data was gathered using the North

American Industry Classification System (NAICS). Values added were taken from Bureau of Economic Analysis (BEA, www.bea.gov, 2017) and Federal Reserve Economic Data (FRED, https://fred.stlouisfed.org, 2017) was used gross state products for each industry. Energy data was derived from the Energy Information Administration (EIA, www.eia.gov). Energy expenditure for transportation represents that of services. Capitals are residues of the value added in each industry.

Table 1 reveals payments to labor, i.e. management workers (m), professionals (r), service workers (s) and production workers (p). Industry value added in each column is the summation of all factor payments in that column which yields the total. For instance, the value added for the Manufacturing is \$5,889.47billion and that of the Beef Industry is \$97.13billion.

Table 1: Factor Payments (\$bil)

	Manufacturing (M)	Service (S)	Rest of Ag (A)	Beef (B)	Total
Management Workers (m)	91.03	505.07	.77	.39	597.27
Professionals (r)	144.23	865.66	.20	.02	1,010.11
Service Workers (s)	156.77	3,161.75	3.18	1.53	3,323.23
Production Workers (p)	245.19	57.34	9.01	.02	311.56
Capital (k)	5,251.78	31,813.50	422.60	95.17	37,583.06
Energy (e)	.455	.669	.025	.002	1.151
Total	5,889.47	36,403.99	435.79	97.13	42,826.38

Table 2 details the factor share θ matrix derived from the factor payments. Factor shares are the portion of the total payments that each productive factor receives. In sector j, the dollar value of factor input i is $w_{ij} \equiv w_i v_{ij}$ with w_i being the factor price of i and v_{ij} representing the quantity of i used in j. The factor share of i is hence, $\theta_{ij} = w_{ij}/y_j$ with y_j representing the value added in sector j. The value added in the Beef Industry (B) is \$97.13billion and the factor share for service workers (s) is 1.6% (1.53/97.13=0.016). Rest of agriculture (\$422.60billion/\$435.79billion = 0.97, 97%)

and Beef ($95.17billion/$97.13billion = 0.98, 98%) industries have larger capital shares relative to manufacturing ($5.251.78billion/$5889.47billion = 0.89, 89%) and service industries ($31813.50billion/36403.99billion = 0.87, 87%). The table shows that capital gets the major portion of the factor shares across sectors. It is evident in this era that industries employ machines which make up a largely automated production channel.

Table 2: Factor Shares Matrix θ

	Manufacturing (M)	Service (S)	Rest of Ag (A)	Beef (B)
Management Workers (m)	0.0155	0.0139	0.0018	0.0040
Professionals (r)	0.0245	0.0238	0.0005	0.0002
Service Workers (s)	0.0266	0.0869	0.0073	0.0157
Production Workers (p)	0.0416	0.0016	0.0207	0.0002
Capital (k)	0.8917	0.8739	0.9697	0.9799
Energy (e)	0.0001	0.0000	0.0001	0.0000
Total	1.0000	1.0000	1.0000	1.0000

Service workers (s) in the service industry (S) have the biggest share (9%) than those in all the other industries.

The summations of the values in rows in Table 1 are factor income. Factors mobility across industries which shows the same prices leads to industry shares in Table 3. Mathematically industry share is denoted by $\lambda_{ij}= w_{ij}/r_j$, *where* r_j is the summation of payments received by factor j across sectors.

Table 3 presents the industry shares matrix λ. It details industry shares for each sector. Management workers in the service sector for example, have the largest industry share being almost 85%, ($505.07billion/$597.27billion). The table also reveals that production workers in the manufacturing sector receive the largest share which is 78.9% ($245.19billion/$311.56billion).

The Beef Industry seems to have their workers receiving the least share of the factor incomes. It being a portion of the agriculture sector has the least industry shares against the other sectors.

Table 3: Industry Shares λ_{ij}

	Manufacturing (M)	Service (S)	Rest of Ag (A)	Beef (B)	Total
Management Workers (m)	0.1524	0.8456	0.0013	0.0007	1.0000
Professionals (r)	0.1428	0.8570	0.0002	0.0000	1.0000
Service Workers (s)	0.0472	0.9514	0.0010	0.0005	1.0000
Production Workers (p)	0.7870	0.1840	0.0289	0.0001	1.0000
Capital (k)	0.1397	0.8465	0.0112	0.0025	1.0000
Energy (e)	0.3954	0.5808	0.0217	0.0022	1.0000

The adjustment in a cost-minimizing input because of the price change of another is substitution elasticities (Jones, 1965; Takayam, 1982). In sector j, $E_{ij}^{k}=a_{ij}'/w_k'=\theta_{kj}S_{ij}^{k}$ represents the cross-price elasticity between the input of factor i and the payment to factor k. In this, S_{ij}^{k} stands for the Allen (1938) partial elasticity substitution. Cobb-Douglas production indicates that $S_{ij}^{k}=1$. Considering constant elasticity of substitution (CES), any positive value can be scaled for the Allen partial elasticity. $\sum_k E_{ij}^{k} = 0$ and own price elasticities E_{ij}^{i}, considering linear homogeneity of cost function are the negative summations of cross-price elasticities.

Each sector's weighted average of cross-price elasticity denotes the substitution elasticities, $\sigma_{ik}=a_{ij}'/w_k'=\sum_j\lambda_{ij}\ E_{ij}^{k}\ =\ \sum_j\lambda_{ij}\ \theta_{kj}S_{ij}^{k}$. The Cobb-Douglas substitution elasticities, as displayed in Table 4, are derived from the factor and industry shares. A change in capital prices r_j in one industry has no effect on another. Constant elasticity of substitution would scale the elasticities in Table 4. Taking CES = 0.5 for instance, elasticities would be half of the original in the table.

Table 4 presents the factor price elasticities. Energy as a factor, has the largest own price elasticity (-0.2334), which implies that a 10% increase in the price of energy results in a 2.3% reduction in the use of energy.

Table 4: Cobb-Douglas Substitution Elasticities

	Factors					Mfg	Serv	Rest of Ag	Beef
	$w'm$	$w'r$	$w's$	$w'p$	$w'e$	$w'M$	$w'S$	$w'A$	$w'B$
$a'm$	**-0.1232**	0.0238	0.0775	0.0077	0.0000	0.0024	0.0117	0.0000	0.0000
$a'r$	0.0141	**-0.1236**	0.0782	0.0073	0.0000	0.0035	0.0204	0.0000	0.0000
$a's$	0.0139	0.0238	**-0.1251**	0.0035	0.0000	0.0013	0.0826	0.0000	0.0000
$a'p$	0.0148	0.0237	0.0371	**-0.1094**	0.0001	0.0328	0.0003	0.0006	0.0000
$a'e$	0.0142	0.0235	0.0612	0.0178	**-0.2334**	0.0428	0.0732	0.0007	0.0000
$a'M$	0.0155	0.0245	0.0266	0.0416	0.0001	**-0.1083**	0.0000	0.0000	0.0000
$a'S$	0.0139	0.0238	0.0869	0.0016	0.0000	0.0000	**-0.1261**	0.0000	0.0000
$a'A'$	0.0018	0.0005	0.0073	0.0207	0.0001	0.0000	0.0000	**-0.0303**	0.0000
$a'B$	0.0040	0.0002	0.0157	0.0002	0.0000	0.0000	0.0000	0.0000	**-0.0201**

2.3.Comparative Static Elasticities

By inverting system matrix in (3), the comparative static elasticities of factor prices with respect to changes in output prices are realized, using Cramer's rule. The model contributes by generating comparative static changes in outputs and factor prices as output prices change. Table 5 shows derived elasticities of factor prices with respect to output price changes. Price elasticities of output with respect to output prices are observed along the production frontier. As price in a sector increases, output increases due to the labor being attracted to the same and hence, lowering output in other sectors.

Table 5 reveals that the own price elasticity of Beef being 1.0206 implies that 10% increase in the price of beef would cause a 10.2% increase in the return to Beef Industry capital investment.

We observe that wages for the service sector are heavily impacted by the output price increases while the impact on wages in the Beef sector due to increased output prices are almost not in existence. The elasticities for services workers (s) in the Service sector (S) (0.9765) implies that a 10% increase in service outputs prices will raise wages for service worker in Service by 9.77%.

Table 5: Elasticity of Factor Prices with respect to Output Prices

	$p'M$	$p'S$	$p'A$	$p'B$
$w'm$	0.1393	0.8605	0.0001	0.0001
$w'r$	0.1297	0.8704	0.0000	0.0000
$w's$	0.0234	0.9765	0.0001	0.0001
$w'p$	0.8842	0.1056	0.0102	0.0000
$E'e$	0.2972	0.6981	0.0044	0.0004
$r'M$	1.0734	-0.0730	-0.0005	0.0000
$r'S$	-0.0097	1.0097	0.0000	0.0000
$r'A$	-0.0194	-0.0116	1.0310	0.0000
$r'B$	-0.0011	-0.0194	0.0000	1.0206

The own price elasticity of service (1.0097) implies that 10% increase in the price of Service outputs would boost output as labor are attracted from other sectors which would raise productivity and return to capital by 10.09%.

Table 6 presents the elasticities of outputs with respect to changes in output prices. For instance, the own output of the Beef Industry of 0.0206 implies a 0.2% increase in output as price increases by 10%. Own price elasticity of Service (0.0097) implies that 10% increase in service output price will raise the output in the Service sector by only 0.09%. These result are consistent with Hallren and Opanasets (2018) that while relative prices of beef may change due to the repeal of COOL, change in output would be very small.

Table 6: Elasticity of Output with respect to Output Prices

	$p'M$	$p'S$	$p'A$	$p'B$
$x'M$	0.0734	-0.0730	-0.0005	0.0000
$x'S$	-0.0097	0.0097	0.0000	0.0000
$x'A$	-0.0194	-0.0116	0.0310	0.0000
$x'B$	-0.0011	-0.0194	0.0000	0.0206

2.4.Predicted Price Changes and Simulation

Once COOL has been repealed, we assume that each of the regulatory costs as estimated by USDA (2015) in their Economic Analysis of COOL will phase out. We therefore make predictions under two simulation scenarios. With scenario 1, we predict that there would be price increase of 5.5% for the Beef Industry, 2.5% for service and the rest of agriculture and 5.0% for the manufacturing sector. We predict a 10.0% price increase for the manufacturing sector, 5% increase for the service and rest of agriculture and 11.0% change in the Beef Industry. Table 7 shows them all.

Table 7 is a CGE simulation that demonstrates the impacts of price changes on the U.S. economy, due to the repeal of MCOOL, especially the Beef industry. For scenario 1, there would be a reduction of 0.02% and 0.05% in the outputs of the service and the agricultural sectors respectively due to 2.5% increase in output prices in both sectors. A 5% increase in prices and the manufacturing sectors' output increases by 0.18%. The Beef Industry increased in output of 0.06% against a price change of 5.5%. Scenario 2 which simulates higher prices depicts that 10% increase of output price would result in a 0.37% change in outputs for the Manufacturing sector.

Table 7: Beef Industry Adjustments and Price Changes

	% Price Change		*Factor Price*			*Output*		
Scenarios	1	2		1	2		1	2
			w′m	2.85	5.70			
			w′r	2.82	5.65			
			w′s	2.56	5.12			
			w′p	4.71	9.42			
			E′e	3.24	6.49			
M	5.0	10.0	*r′M*	5.18	10.37	*x′*M	0.18	0.37
S	2.5	5.0	*r′S*	2.48	4.95	*x′*S	-0.02	-0.05
A	2.5	5.0	*r′A*	2.45	4.90	*x′*A	-0.05	-0.10
B	5.5	11.0	*r′B*	5.56	11.12	*x′*B	0.06	0.12

A reduction of 0.05% in the service sector is estimated due to a 5% change in output prices. The rest of agriculture sees a 0.10% change in outputs as price changes by 5%. Since consumers would purchase beef without the information of the place of origin, scenario 2 predicts 11% change in prices which results in a 0.12% change in outputs.

Long term approximates of output changes due to changes in prices as a result of the repeal of MCOOL are detailed in Table 8. The model shows that the short-term price changes result in a very small change in outputs. This implies that U.S. can produce beef to meet demand without having to be competitively disadvantaged. However, in the long-term, we see a greater change in output considering the same price adjustments.

It is assuming that outputs follow the same rate at which capital changes given constant returns to capital. The manufacturing sector sees 5.18% and 10.37% output changes in both scenarios respectively, 2.48% and 4.95% changes in the service sector, an addition of 2.45% and 4.90% in the rest of agriculture and 5.56% and 11.12% output change in the Beef Industry.

Table 8: Long-run adjustment in Beef Prices

	% Price Change			*Output*	
Scenarios	1	2		1	2
M	5.0	10.0	x'M	5.18	10.37
S	2.5	5.0	x'S	2.48	4.95
A	2.5	5.0	x'A	2.45	4.90
B	5.5	11.0	x'B	5.56	11.12

3.0.CONCLUSION

The present paper applied specific factors model and projects the range of income redistribution and output changes in the U.S. beef sector as it adjusts to USMCA. The beef sector will enjoy modest economic growth with USMCA through rising prices and export opportunities for product capital intensive service and manufacturing sectors while the **rest of agriculture and the Beef Industry see a rising capital returns in both scenarios even in the long run.**

Output and wage adjustments will not be overwhelming under reasonable price scenarios but adjustments in capital returns are magnified effects of price changes. Wage adjustments are small due to the assumption of labor mobility across industries and would be magnified effects of price changes if labor were immobile between industries. Labor could retrain in response to changing wages for particular skills and labor mobility between skill groups would diminish the wage impacts.

REFERENCES

Ahmed, L., 2018. U.S. Corn Exports to Mexico and the North American Free Trade Agreement.

Black, T. (2017). American Jobs Are Headed to Mexico Once Again.

Bown, C. P., & Brewster, R. (2017). US–COOL Retaliation: The WTO's Article 22.6 Arbitration. World Trade Review, 16(2), 371-394.

Chang, W. W. (1979). Some theorems of trade and general equilibrium with many goods and factors. Econometrica: Journal of the Econometric Society, 709-726.

Ebell, M., Hurst, I. & Warren, J., 2016. Modelling the long-run economic impact of leaving the European Union. Economic Modelling, 59, pp.196-209.

Farm Credit Administration (2019). Retrieved from https://www.fca.gov/template-fca/download/MajorUSAgriculturalExportMarkets.pdf [Accessed 10 Oct, 2018].

Federal Reserve Economic Data | FRED | St. Louis Fed. (2018). Retrieved from https://fred.stlouisfed.org/beling (COOL) Using a Vertically Integrated Armington Model with Monte Carlo Simulation. Southern Economic Journal, 84(3), 879-897.

Hallren, R., & Opanasets, A. (2018). Whence the Beef: The Effect of Repealing Mandatory Country of Origin La Ahmed, L., 2018. U.S. Corn Exports to Mexico and the North American Free Trade Agreement.

Hendrix, C. S., 2017. Agriculture in the NAFTA Renegotiation. Peterson Institute for International Economics. https://www.ers.usda.gov/data-products/agricultural-trade-multipliers/effects-of-trade-on-the-U.S-economy/

Johnson, R., 2017. The North American Free Trade Agreement (NAFTA) and U.S. Agriculture.

Jones, R. W. (1965). The structure of simple general equilibrium models. Journal of political Economy, 73(6), 557-572.

Jones, R. W., & Scheinkman, J. A. (1977). The relevance of the two-sector production model in trade theory. Journal of Political Economy, 85(5), 909-935.

Lofgren, H., Harris, R. L., & Robinson, S. (2002). A standard computable general equilibrium (CGE) model in GAMS (Vol. 5). Intl Food Policy Res Inst.

Lusk, J. L., & Anderson, J. D. (2004). Effects of country-of-origin labeling on meat producers and consumers. Journal of Agricultural and Resource Economics, 185-205.

McGrattan, E.R. & Waddle, A., 2017. The impact of Brexit on foreign investment and production (No. w23217). National Bureau of Economic Research.

Plain, R., & Grimes, G. (2003). Benefits of COOL to the Cattle Industry. Pub. No. AEWP, 2.

Robinson, S. & Thierfelder, K., 2018. U.S. Withdrawal from International Trade: Analyzing the Impact on the Global Trading System with a Global CGE Model and a Gravity Model.

Slaughter, M.J., 2018. How Withdrawing from NAFTA Would Damage the U.S. Economy.

Steinberg, J.B., 2018. The Macroeconomic Impact of NAFTA Termination PRELIMINARY—DO NOT CIRCULATE.

Takayama, A. (1982). On Theorems of General Competitive Equilibrium of Production And Trade: A. Keio Economic Studies, 19(1), 1-37.

Turunen, M.T., Rasmus, S. and Kietäväinen, A., 2018. The Importance of Reindeer in Northern Finland during World War II (1939–45) and the Post-War Reconstruction. ARCTIC, 71(2), pp.167-182.

U.S. Bureau of Labor Statistics. (2018). Retrieved from https://www.bls.gov/ [Accessed 15 Oct, 2018]

U.S. Energy Information Administration (EIA). (2019). Retrieved from https://www.eia.gov/

United States Department of Agriculture Economic Research Service (USDA, ERS). 2018. Effect of trade on the United States Economy [accessed September 10, 2018]

USDA (2015). Economic Analysis of Country of Origin Labeling (COOL). Retrieved from https://www.usda.gov/oce/economics/reports/COOL_ReportToCongress.pdf

USDA (2017). Report on the proposed 2017 Reorganization of the Department of Agriculture to Establish an Under Secretary for Trade and Foreign Agriculture Affairs. Retrieved from https://www.usda.gov/sites/default/files/documents/report-proposed-2017- reorg-usda-under-secretary-trade-foreign-ag-affairs.pdf

Villareal, M. and Fergusson, I.F., 2017. The North American Free Trade Agreement (NAFTA).

Yeboah, O. A., Naanwaab, C., & Otchere, R. (2015). Demand for Beef Associated with Country of Origin Labeling. In 2015 Annual Meeting, January 31-February 3, 2015, Atlanta, Georgia (No. 196859). Southern Agricultural Economics Association.

Yeboah, O., Naanwaab, C. B., & Efraim, E. (2016, January). Analyzing the Welfare Impact of Mandatory Country of Origin Labeling on Producers and Consumers; The Case of US Beef and Pork. In 2016 Annual Meeting, February 6-9, 2016, San Antonio, Texas (No. 229988). Southern Agricultural Economics Association.