

University of
Lethbridge



The Effects of Trade Barriers on Canada's Beef Exports: An Empirical Investigation

Pascal L. Ghazalian
Department of Economics
University of Lethbridge

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Introduction

- The continuously growing global demand for beef has generated exporting opportunities for Canadian beef producers. It rendered expanding market access to foreign countries to be one of the primary objectives for the Canadian beef industry.
- The United States remains the principal destination for Canada's beef exports, accounting for around 70.1% of Canada's total beef exports in 2015 (*i.e.*, 1,110.0 million US\$ from a total of 1,583.7 million US\$).
- China (including Hong Kong and Macao), Mexico, and Japan are important destinations for Canada's beef exports, accounting for 15.4%, 6.9%, and 2.9% of Canada's total beef exports in 2015, respectively.
- Canada's beef exports to other countries are relatively small, covering less than 5.0% of Canada's total beef exports in 2015.



Introduction

- The destinations of Canada's beef exports covered 78 countries over recent years. Several bilateral values of Canada's beef exports are relatively small, falling below 2.0 million US\$.
- There have been persistent efforts by the Canadian beef industry to increase exports to traditional markets, and to penetrate and expand exports to emerging and developing markets. In this context, the Canadian Cattlemen's Association (CCA) specified priorities to promote Canada's beef exports (Masswohl & Laycraft, 2015).



Introduction

- Improvements in market access are naturally associated with reductions in trade costs, which include all costs of getting a product from producer to consumer, over and above the marginal costs of production (Anderson & van Wincoop, 2004).
- Canada's beef exports have been exposed to tariffs and Non-Tariff Barriers (NTBs), which are often deemed to be significant obstacles facing Canada's beef exports (Ghazalian *et al.*, 2012; Masswohl & Laycraft, 2015). NTBs cover a diverse list of trade impediments that include quotas, administrative delays, bureaucratic red tapes, standards, specifications, and other technical barriers to trade. In a broad sense,
- Trade flows could be limited due to inadequacy of bilateral business networks and inferior bilateral exporting performance, and due to the prevalence of bilateral transaction costs.
- Canada's beef exports have been exposed to explicit regulatory, technical and political trade restricting policies imposed by a number of destination countries throughout recent years.



Tariffs – taxes on imports

- *ad valorem*
- Specific
- Compound (*ad valorem* and specific components)

Observable & unobservable barriers:

- Business-related trade restrictions
- Inadequate bilateral trade relationships
- Transaction costs

Non-Tariff Barriers

- Import quotas
- Administrative delays
- Bureaucratic red tapes
- Standards
- Specifications
- Other technical barriers

Objectives



- To estimate the implications of trade barriers for Canada's beef exports. International trade costs can be estimated through the empirical analysis of bilateral trade flows using gravity models (Bergstrand, 1985, 1989; Anderson & van Wincoop, 2003; Helpman *et al.*, 2008).
- To estimate the effects of PTAs (*e.g.*, NATA) on Canada's beef exports.
- To assess the effects of trade barriers on Canada's beef exports in terms of existing trading relationships (intensive margin of trade), and in terms of number of active beef trading relationships (extensive margin of trade).



Objectives

- To examine the extent of unexploited market opportunities for the Canadian beef industry in traditional foreign markets (*e.g.*, Hong Kong, Japan, Mexico, the United States), in EU countries, and in emerging and developing markets (*e.g.*, Chile, China (mainland), Egypt, Indonesia, Malaysia, Philippines, Russia, Thailand, Vietnam).
- To evaluate the competitiveness of the Canadian beef industry in foreign markets vis-à-vis major beef-exporting countries (*e.g.*, Argentina, Australia, Brazil, New Zealand, Paraguay the United States, Uruguay).



The Gravity Model

- Following Bergstrand (1985, 1989), we theorize that the destination markets are not perfectly substitutable for beef exports from the perspectives of the beef exporting countries. This imperfect substitutability is modeled through a Constant Elasticity of Transformation (CET) supply framework.
- Baier & Bergstrand (2001) indicated that the CET reflects distribution costs associated with entering foreign markets. Alternatively, Head and Mayer (2014) suggested that CET is a manifestation of upward-sloping marginal costs of exporting to each market.



The Gravity Model

The derivation of the gravity model through the CET framework yields:

$$EXP_{ij}^g = Y_i^g D_j^g \frac{(t_{ij}^g)^{-(1+\varphi^g)} (b_{ij}^g)^{-(1+\varphi^g)} (c_i^g)^{-1}}{(R_i^g)^{(1+\varphi^g)} (S_j^g)^{(1+\varphi^g)}}$$

where the multilateral resistance terms of the exporter and importer are respectively determined as:

$$R_i^g = \sum_m \left\{ \left[p_m^g (t_{im}^g)^{-1} (b_{im}^g)^{-1} \right]^{(1+\varphi^g)} \right\}^{g^g / (1+\varphi^g)}$$

$$S_j^g = \left[\sum_m Y_m^g (t_{mj}^g)^{-\varphi^g} (b_{mj}^g)^{-(1+\varphi^g)} (c_m^g)^{-1} / (R_m^g)^{(1+\varphi^g)} \right]^{1/(1+\varphi^g)}$$



Letting q_{mj}^g depict the exported quantity from country m to country j , we get:

$$D_j^g = p_j^g \sum_m q_{mj}^g \Rightarrow p_j^g = D_j^{1/(1+\varphi^g)} / S_j^g$$

Given that the focus of this study is on Canada's beef exports, bilateral policy trade barriers are specified through:

$$t_{ij}^g = (1 + TAR_{ij}^g) \left[\exp \left(\theta_0^{g(k)} + \sum_k \theta_1^{g(k)} PTA_{ij}^{(k)} + \sum_{\tilde{m}} \theta_2^{g(\tilde{m})} PEX_{ij}^{(\tilde{m})} + \sum_{\tilde{m}} \theta_3^{g(\tilde{m})} CAN_{ij}^{(\tilde{m})} \right) \right]$$

The bilateral non-policy barriers as:

$$b_{ij} = DIST_{ij}^{\delta^g} \left[\exp \left(\lambda_0^g + \lambda_1^g CONT_{ij} + \lambda_2^g LANG_{ij} + \lambda_3^g COL_{ij} \right) \right]^{-1}$$



Econometric Methodology

- The prevalence of zero bilateral trade flow observations, particularly in the case of bilateral trade datasets covering disaggregated beef product categories, requires an appropriate econometric method.
- The Heckman selection model has been often used for such datasets through a log-linear specification of the gravity model (*e.g.*, Helpman *et al.*, 2008) to tackle sample selection bias. This econometric approach allows for the estimation of the effects of trade barriers on bilateral trade flows at the intensive and extensive margins.
- In parallel, seminal studies advocated the estimation of the multiplicative form of the gravity model (Santos Silva & Tenreyro, 2006, 2011; Burger *et al.*, 2009). They indicated that the estimation of the log-linear specification of the gravity model would yield biased estimates in the presence of heteroskedasticity, which commonly characterizes bilateral trade flow datasets, due to Jensen's inequality.

$$E[\ln(x)] \neq \ln[E(x)]$$



Econometric Methodology

- Santos Silva & Tenreyro (2006) recommended the use of the Poisson Pseudo-Maximum Likelihood (PPML) model to estimate the multiplicative form of the gravity model.
- Burger *et al.* (2009) indicated that the PPML model could yield biased estimates when implementing the empirical analysis for a dataset characterized by a frequency of zero bilateral trade observations. They suggested the use of the more flexible Zero-Inflated (ZI) models.
- Burger *et al.* (2009) examined variant estimators belonging to the Poisson/Negative Binomial (NB) family for the multiplicative gravity model, including the NBPML, ZI-PPML, and ZI-NBPML estimators.
- The ZI-PPML and ZI-NBPML models do not require exclusion restrictions that normally characterize the Heckman model.
- The Vuong statistical test (Vuong, 1989) is used to favour the conventional model or the corresponding ZI model. Also, the Likelihood Ratio (LR) test of over-dispersion is used to favour the Poisson models or the corresponding NB models.



The empirical gravity equation is given as:

$$EXP_{ij}^g = \exp \left(\begin{aligned} & \kappa_0^g + \tilde{\beta}_1^g \ln PROD_i^g + \tilde{\beta}_2^g \ln GDPC_i + \tilde{\beta}_3^g \ln GDP_j + \tilde{\beta}_4^g \ln GDPC_j \\ & + \tilde{\varphi}^g \ln(1 + TAR_{ij}^g) + \sum_k \tilde{\theta}_1^{g(k)} PTA_{ij}^{(k)} + \sum_{\tilde{m}} \tilde{\theta}_2^{g(\tilde{m})} PEX_{ij}^{(\tilde{m})} + \sum_{\tilde{m}} \tilde{\theta}_3^{g(\tilde{m})} CAN_{ij}^{(\tilde{m})} \\ & + \tilde{\delta}^g \ln DIST_{ij} + \tilde{\lambda}_1^g CONT_{ij} + \tilde{\lambda}_2^g LANG_{ij} + \tilde{\lambda}_3^g COL_{ij} \\ & \tilde{\xi}^g \ln C_i^g + \tilde{\varphi}^g \ln R_i^g + \tilde{\varphi}^g \ln S_j^g \end{aligned} \right) + u_{ij}^g$$

- The estimated parameters are used to execute different scenarios that examine the implications of tariffs and non-tariff barriers for Canada's bilateral beef exports (Lai & Zhu, 2004; Ghazalian *et al.*, 2011; Raimondi & Olper, 2011; Bergstrand *et al.*, 2013).



Magnitude of Trade

Distinct scenarios are specified:

- Scenario-A which consists of removing tariffs.
- Scenario-B which consists of dropping non-tariff barriers to the baseline level of primary exporters.
- Scenario-C which consists of eliminating both tariffs and non-tariff barriers.



Magnitude of Trade

- The magnitudes of exports associated with Scenario-A, Scenario-B, and Scenario C are determined as:

$$\text{Scenario-A: } ME_A^g(CAN \rightarrow j) = \frac{E\left(EXP_{CANj}^g \mid TAR_{CANj}^g, \tilde{\theta}_3^{g(\tilde{m})}\right)}{E\left(EXP_{CANj}^g \mid TAR_{CANj}^g \rightarrow 0, \tilde{\theta}_3^{g(\tilde{m})}\right)}$$

$$\text{Scenario-B: } ME_B^g(CAN \rightarrow j) = \frac{E\left(EXP_{CANj}^g \mid TAR_{CANj}^g, \tilde{\theta}_3^{g(\tilde{m})}\right)}{E\left(EXP_{CANj}^g \mid TAR_{CANj}^g, \tilde{\theta}_3^{g(\tilde{m})} \rightarrow 0\right)}$$

$$\text{Scenario-C: } ME_C^g(CAN \rightarrow j) = \frac{E\left(EXP_{CANj}^g \mid TAR_{CANj}^g, \tilde{\theta}_3^{g(\tilde{m})}\right)}{E\left(EXP_{CANj}^g \mid TAR_{CANj}^g \rightarrow 0, \tilde{\theta}_3^{g(\tilde{m})} \rightarrow 0\right)}$$



Magnitude of Trade

- These benchmark magnitudes are determined when reductions in trade barriers are implemented for Canada's beef exports, and when policy trade barriers facing other beef exporting countries remain unchanged.
- The empirical analysis will be extended by examining alternative scenarios where decreases in tariffs and non-tariff barriers facing Canada's beef exports are accompanied with decreases in policy trade barriers facing other beef exporting countries.
- Scenario-D covers all the characteristics of Scenario C. In addition, Scenario-D encompasses removing tariffs across all primary beef exporting countries (*i.e.*, $TAR_{ij}^g \rightarrow 0$) and lowering NTBs across all primary beef exporting countries (*i.e.*, $\tilde{\theta}_2^{g(\tilde{m})} \rightarrow \bar{\theta}_2^{g(\tilde{m})}$).



Magnitude of Trade

The magnitude of beef exports obtained from Scenario-D is determined as:

$$ME_D^g(CAN \rightarrow j) = \frac{E\left(EXP_{CANj}^g \mid TAR_{CANj}^g, \tilde{\theta}_3^{g(\tilde{m})}; TAR_{ij}^g, \tilde{\theta}_2^{g(\tilde{m})} PEX_{ij}^{(\tilde{m})} \right)}{E\left(EXP_{CANj}^g \mid TAR_{CANj}^g \rightarrow 0, \tilde{\theta}_3^{g(\tilde{m})} \rightarrow 0; TAR_{ij}^g \rightarrow 0, \tilde{\theta}_2^{g(\tilde{m})} \rightarrow \bar{\theta}_2^{g(\tilde{m})} \text{ for } i \notin CAN \right)}$$



- The empirical analysis examines the effects of tariffs and non-tariff trade barriers on Canada's beef exports, covering four disaggregated beef product categories:

bovine cuts bone-in, fresh or chilled (HS 020120)

bovine cuts boneless, fresh or chilled (HS 020130)

bovine cuts bone-in, frozen (HS 020220)

bovine cuts boneless, frozen (HS 020230)

- Bilateral trade flow observations are derived from the United Nations Commodity Trade Statistics Database (UN Comtrade). Bilateral tariff rates and other policy trade barriers (*e.g.*, specific taxes, compound tariffs) are sourced from the Trade Analysis and Information System (TRAINS) database. Production and domestic prices are collected from the Food and Agriculture Organization Statistics (FAOSTAT) database, and from national statistical sources. Bilateral geographic distance, contiguity, and bilateral socio-economic variables are sourced from the *Centre d'Études Prospectives et d'Informations Internationales* (CEPII).



	Bovine Cuts Bone-In, Fresh or Chilled	Bovine Cuts Boneless, Fresh or Chilled	Bovine Cuts Bone-In, Frozen	Bovine Cuts Boneless, Frozen
Algeria	30.0	30.0	30.0	30.0
Angola	10.0	10.0	10.0	10.0
Argentina	10.0	12.0	10.0	12.0
Australia	0.0	0.0	0.0	0.0
Bolivia	10.0	10.0	10.0	10.0
Botswana	40.0	40.0	40.0	40.0
Brazil	10.0	12.0	10.0	12.0
Cameroon	20.0	20.0	20.0	20.0
Chile*	0.0	0.0	0.0	0.0
Côte d'Ivoire (2011-2014)	20.0	20.0	20.0	20.0
Côte d'Ivoire (2015)	35.0	35.0	35.0	35.0
Egypt	0.0	0.0	0.0	0.0
European Union (2011)	66.3	76.5	83.5	98.8
European Union (2012)	64.3	73.0	80.9	90.4
European Union (2013)	62.6	69.8	79.4	88.4
European Union (2014)	62.1	68.2	81.0	85.9
European Union (2015)	62.3	66.5	74.7	80.6
India	30.0	30.0	30.0	30.0
Indonesia	5.0	5.0	5.0	5.0
Japan	38.5	38.5	38.5	38.5
Jordan (2011-2013)	0.0	10.0	0.0	10.0
Jordan (2014-2015)	0.0	0.0	0.0	3.9
Kazakhstan (2011-2012)	32.5	26.7	32.5	26.7
Kazakhstan (2013-2015)	23.8	23.8	23.8	23.8
Mexico*	0.0	0.0	0.0	0.0



	Bovine Cuts Bone-In, Fresh or Chilled	Bovine Cuts Boneless, Fresh or Chilled	Bovine Cuts Bone-In, Frozen	Bovine Cuts Boneless, Frozen
Morocco (2011-2013)	254.0	254.0	254.0	194.9
Morocco (2014-2015)	200.0	200.0	200.0	152.5
Nigeria (2011-2014)	20.0	20.0	20.0	20.0
Nigeria (2015)	35.0	35.0	35.0	35.0
Norway (2011)	201.8	303.2	279.2	495.5
Norway (2012)	202.0	289.9	280.5	459.1
Norway (2013)	193.3	311.5	273.8	392.8
Norway (2014)	186.7	304.0	277.9	378.3
Norway (2015)	177.5	292.1	238.1	352.3
Philippines	10.0	10.0	10.0	10.0
Rep. of Korea (2011-2014)	40.0	40.0	40.0	40.0
Rep. of Korea (2015)	37.3	37.3	37.3	37.3
Russia (2011-2012)	32.5	26.7	32.5	26.7
Russia (2013-2015)	23.8	23.8	23.8	23.8
Saudi Arabia	0.0	0.0	5.0	5.0
South Africa	40.0	40.0	40.0	40.0
Switzerland (2011)	140.1	167.2	192.1	253.8
Switzerland (2012)	141.5	159.7	195.8	241.5
Switzerland (2013)	140.3	154.8	196.6	236.2
Switzerland (2014)	142.0	150.6	193.0	224.6
Switzerland (2015)	139.8	151.0	197.1	230.1
Tunisia	36.0	36.0	36.0	36.0
Turkey (2011-2012)	78.8	225.0	78.8	225.0
Turkey (2013-2015)	131.3	225.0	131.3	225.0
United States of America*	0.0	0.0	0.0	0.0
Venezuela	20.0	20.0	20.0	20.0
Vietnam	20.0	14.0	20.0	14.0



Estimation Results

- The basic estimations are implemented using the PPML, NBPML, ZI-PPML and ZI-NBPML estimators across the beef product equations.
- The Vuong test and the LR test of over-dispersion are implemented to select the favoured estimator. The LR test rejects the null hypothesis at the 1% level, indicating that the NB models are favoured over the Poisson models.
- The Vuong test rejects the null hypothesis at the 1% level, showing that the zero-inflated models are more appropriate estimators compared to the standard models across the beef product categories. Based on these statistical tests, we carry out the empirical analysis using the ZI-NBPML estimator across the beef product equations.
- Following the empirical literature (Santos Silva and Tenreyro, 2006; Sun and Reed, 2010; Xiong and Beghin, 2012), Ramsey's specification error test is implemented. This test reveals that the null hypothesis is rejected at the 1% level, implying misspecification issues associated with the log-linear form of the gravity model.



Estimated Parameters (ZI-NBPML Model)

	(1)	(2)	(3)	(4)
	Bovine Cuts Bone-In, Fresh or Chilled	Bovine Cuts Boneless, Fresh or Chilled	Bovine Cuts Bone-In, Frozen	Bovine Cuts Boneless, Frozen
	<i>Trade Equations</i>			
CET (Bilateral Tariffs)	2.080a (0.235)	1.876a (0.192)	3.035a (0.239)	2.583a (0.224)
Bilateral Distance	-1.277a (0.095)	-1.394a (0.082)	-0.884a (0.090)	-1.080a (0.076)
Contiguity	0.861a (0.121)	0.734a (0.127)	0.516a (0.132)	0.398a (0.109)
Colonial Ties	0.213c (0.127)	0.311b (0.133)	0.508a (0.146)	0.595a (0.129)
Linguistic Ties	0.178 (0.130)	0.236c (0.132)	0.329b (0.136)	0.647a (0.112)
Supply Capacity	0.573a (0.036)	0.764a (0.050)	0.388a (0.046)	0.591a (0.035)
Demand Capacity	0.948a (0.035)	0.732a (0.031)	0.860a (0.032)	0.696a (0.028)
Exporter's Cost Function	-0.427a (0.041)	-0.210a (0.035)	-0.144a (0.039)	-0.108a (0.034)
Importer's GDPC	0.176a (0.043)	0.325a (0.040)	0.391a (0.035)	0.227a (0.033)



Estimated Parameters (ZI-NBPML Model)

	(1)	(2)	(3)	(4)
	Bovine Cuts Bone- In, Fresh or Chilled	Bovine Cuts Boneless, Fresh or Chilled	Bovine Cuts Bone- In, Frozen	Bovine Cuts Boneless, Frozen
<i>Inflation Equations</i>				
Bilateral Tariffs	0.477a (0.102)	0.730a (0.116)	1.073a (0.107)	0.768a (0.076)
BV(Canada→G1)	0.630a (0.186)	0.472a (0.130)	0.597a (0.134)	0.685a (0.112)
BV(Canada→G2)	0.828a (0.158)	0.975a (0.137)	1.114a (0.174)	0.901a (0.152)
Bilateral Distance	0.797a (0.050)	0.519a (0.041)	0.547a (0.047)	0.591a (0.033a)
Contiguity	-0.964a (0.135)	-0.991a (0.120)	-0.668a (0.127)	-0.717a (0.106)
Colonial Ties	-0.632a (0.148)	-0.399a (0.125)	-0.371a (0.130)	-0.292a (0.095)
Linguistic Ties	-0.679a (0.089)	-0.634a (0.070)	-0.715a (0.082)	-0.543a (0.064)
Supply Capacity	-0.653a (0.021)	-0.600a (0.018)	-0.521a (0.018)	-0.549a (0.015)
Demand Capacity	-0.276a (0.018)	-0.214a (0.014)	-0.158a (0.016)	-0.175a (0.012)
Exporter's GDPC	-0.693a (0.038)	-0.498a (0.029)	-0.597a (0.033)	-0.460a (0.023)
Importer's GDPC	-0.559a (0.031)	-0.645a (0.024)	-0.382a (0.027)	-0.342a (0.018)



Bovine Cuts Bone-In, Fresh or Chilled

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Estimated Coefficient	Magnitude of Trade – Scenario-A	Magnitude of Trade – Scenario-B	Magnitude of Trade – Scenario-C	Magnitude of Trade – Scenario-A (1,000 US\$)	Magnitude of Trade – Scenario-B (1,000 US\$)	Magnitude of Trade – Scenario-C (1,000 US\$)
Canada→Germany	-2.872a (0.214)	0.359	0.057	0.021	186.4	1,711.7	4,937.6
Canada→Italy	-2.436a (0.187)	0.359	0.089	0.032	143.3	824.4	2,426.5
Canada→Japan	-2.790a (0.223)	0.517	0.071	0.037	86.7	1,204.5	2,396.1
Canada→Mexico	1.198a (0.216)	1.320*	2.790*	3.903*	748.0*	1,977.3*	2,292.5*
Canada→Rep. of Korea	-3.415a (0.240)	0.498	0.033	0.017	303.0	8,833.4	17,703.5
Canada→Switzerland	-0.801a (0.225)	0.162	0.458	0.076	906.7	207.7	2,120.8
Canada→United States	1.740a (0.204)	1.071*	4.716*	5.089*	5,145.1*	61,433.5*	62,647.6*

Bovine Cuts Bone-In, Fresh or Chilled



	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Estimated Coefficient	Magnitude of Trade – Scenario-A	Magnitude of Trade – Scenario-B	Magnitude of Trade – Scenario-C	Magnitude of Trade – Scenario-A (1,000 US\$)	Magnitude of Trade – Scenario-B (1,000 US\$)	Magnitude of Trade – Scenario-C (1,000 US\$)
Canada→Chile	-3.143a (0.327)	0.920	0.044	0.040	2.5	627.4	686.2
Canada→Hong Kong	0.387b (0.173)	**	1.607*	**	**	318.5*	**
Canada→Russia	-2.924a (0.261)	0.590	0.054	0.032	39.8	1,001.4	1,746.0
Canada→Saudi Arabia	-1.930a (0.257)	**	0.158	**	**	776.4	**
Canada→United Arab Emirates	-2.234a (0.250)	**	0.107	**	**	4,713.5]	**

Bovine Cuts Boneless, Fresh or Chilled



	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Estimated Coefficient	Magnitude of Trade – Scenario-A	Magnitude of Trade – Scenario-B	Magnitude of Trade – Scenario-C	Magnitude of Trade – Scenario-A (1,000 US\$)	Magnitude of Trade – Scenario-B (1,000 US\$)	Magnitude of Trade – Scenario-C (1,000 US\$)
Canada → France	-0.870a (0.201)	0.362	0.424	0.154	2,925.5	2,257.5	9,143.8
Canada → Germany	-4.318a (0.203)	0.362	0.014	0.005	2,164.0	89,711.5	249,407.8
Canada → Italy	-2.682a (0.236)	0.361	0.069	0.025	2,077.2	15,846.0	45,781.9
Canada → Japan	-3.241a (0.170)	0.551	0.040	0.022	12,114.9	359,425.6	660,862.1
Canada → Mexico	1.956a (0.176)	1.375*	6.529*	9.128*	28,598.4*	88,772.4*	93,343.2*
Canada → Netherlands	-5.302a (0.248)	0.362	0.005	0.002	272.7	30,578.1	84,541.5
Canada → Rep. of Korea	-4.400a (0.290)	0.533	0.012	0.007	570.4	52,050.0	97,667.3
Canada → Switzerland	-1.178a (0.192)	0.176	0.315	0.056	16,985.5	7,862.9	61,345.9
Canada → United States	0.654a (0.175)	1.081*	1.536*	1.720*	58,781.6*	274,451.3*	329,087.9*

Bovine Cuts Boneless, Fresh or Chilled



	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Estimated Coefficient	Magnitude of Trade – Scenario-A	Magnitude of Trade – Scenario-B	Magnitude of Trade – Scenario-C	Magnitude of Trade – Scenario-A (1,000 US\$)	Magnitude of Trade – Scenario-B (1,000 US\$)	Magnitude of Trade – Scenario-C (1,000 US\$)
Canada→China	-4.952a (0.318)	0.812	0.007	0.006	9.5	5,611.3	6,867.4
Canada→Hong Kong	-1.317a (0.230)	**	0.271	**	**	7,598.0	**
Canada→Jordan	-8.015a (0.260)	**	0.0003	**	**	8,744.8	**
Canada→Russia	-5.763a (0.306)	0.657	0.003	0.002	7.3	4,384.2	6,738.0
Canada→Saudi Arabia	-3.391a (0.232)	**	0.034	**	**	13,480.2	**
Canada→Singapore	-5.154a (0.245)	**	0.006	**	**	5,309.0	**
Canada→Thailand	-4.016a (0.214)	0.471	0.018	0.009	32.2	1,536.1	3,328.7
Canada→United Arab Emirates	-3.189a (0.247)	**	0.042	**	**	16,310.5	**



	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Estimated Coefficient	Magnitude of Trade – Scenario-A	Magnitude of Trade – Scenario-B	Magnitude of Trade – Scenario-C	Magnitude of Trade – Scenario-A (1,000 US\$)	Magnitude of Trade – Scenario-B (1,000 US\$)	Magnitude of Trade – Scenario-C (1,000 US\$)
Canada→Japan	-2.834a (0.245)	0.384	0.061	0.023	411.3	3,966.3	10,640.6
Canada→Mexico	0.580a (0.152)	1.889*	1.649*	3.194*	189.6*	158.6*	276.8*
Canada→Rep. of Korea	-2.418a (0.228)	0.371	0.091	0.033	10,024.9	59,407.6	174,846.1
Canada→United States	1.214a (0.181)	1.159*	2.763*	3.522*	2,151.8*	10,012.6*	11,236.2*



	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Estimated Coefficient	Magnitude of Trade – Scenario-A	Magnitude of Trade – Scenario-B	Magnitude of Trade – Scenario-C	Magnitude of Trade – Scenario-A (1,000 US\$)	Magnitude of Trade – Scenario-B (1,000 US\$)	Magnitude of Trade – Scenario-C (1,000 US\$)
Canada→Chile	-2.195a (0.249)	0.903	0.116	0.105	7.0	497.2	552.7
Canada→Dominican Republic	-2.706a (0.234)	0.362	0.067	0.024	86.9	681.8	1,970.0
Canada→Hong Kong	0.358c (0.207)	**	1.301*	**	**	12,481.0*	**
Canada→Indonesia	-5.460a (0.193)	0.865	0.004	0.004	0.7	1,036.1	1,198.8
Canada→Philippines	-1.959a (0.285)	0.754	0.141	0.109	36.5	678.5	910.5
Canada→Russia	-0.805a (0.235)	0.472	0.463	0.222	489.5	507.6	1,530.6
Canada→Saudi Arabia	-0.985a (0.228)	0.866	0.375	0.325	345.1	3,715.4	4,620.8
Canada→Vietnam	-3.751a (0.312)	0.578	0.024	0.014	11.0	614.0	1,065.4
Canada→United Arab Emirates	-5.036a (0.308)	0.865	0.007	0.006	1.0	964.4	1,114.9

Bovine Cuts Boneless, Frozen



	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Estimated Coefficient	Magnitude of Trade – Scenario-A	Magnitude of Trade – Scenario-B	Magnitude of Trade – Scenario-C	Magnitude of Trade – Scenario-A (1,000 US\$)	Magnitude of Trade – Scenario-B (1,000 US\$)	Magnitude of Trade – Scenario-C (1,000 US\$)
Canada → France	-0.857a (0.231)	0.203	0.438	0.085	3,622.9	1,183.2	9,872.0
Canada → Germany	-4.334a (0.264)	0.202	0.015	0.003	570.1	9,229.8	46,119.7
Canada → Japan	-1.490a (0.183)	0.464	0.240	0.107	51,783.3	141,596.2	373,727.5
Canada → Mexico	-1.284a (0.211)	1.718*	0.294	0.451	891.8*	5,120.4	2,602.9
Canada → Rep. of Korea	-3.496a (0.218)	0.422	0.033	0.014	3,830.4	82,760.5	200,497.4
Canada → Switzerland	-3.710a (0.223)	0.046	0.026	0.001	716.1	1,306.3	29,107.2
Canada → United States	-2.745a (0.194)	1.165*	0.069	0.071	6,935.3*	655,020.3	636,746.1

Bovine Cuts Boneless, Frozen



	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Estimated Coefficient	Magnitude of Trade – Scenario-A	Magnitude of Trade – Scenario-B	Magnitude of Trade – Scenario-C	Magnitude of Trade – Scenario-A (1,000 US\$)	Magnitude of Trade – Scenario-B (1,000 US\$)	Magnitude of Trade – Scenario-C (1,000 US\$)
Canada→Chile	-2.471a (0.272)	0.918	0.085	0.079	17.3	2,085.6	2,281.9
Canada→China	-0.875a (0.241)	0.813	0.446	0.348	14,895.7	80,425.8	121,261.8
Canada→Colombia	-1.426a (0.226)	0.220	0.243	0.054	536.3	472.6	2,672.2
Canada →Egypt	-5.368a (0.258)	**	0.005	**	**	95,030.1	**
Canada→Hong Kong	-1.393a (0.207)	**	0.257	**	**	118,972.3	**
Canada→Indonesia	-4.502a (0.304)	0.885	0.011	0.010	25.6	16,964.6	19,601.3
Canada→Kazakhstan	-3.768a (0.249)	0.506	0.023	0.012	24.5	1,054.9	2,110.1

Bovine Cuts Boneless, Frozen



	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Estimated Coefficient	Magnitude of Trade – Scenario-A	Magnitude of Trade – Scenario-B	Magnitude of Trade – Scenario-C	Magnitude of Trade – Scenario-A (1,000 US\$)	Magnitude of Trade – Scenario-B (1,000 US\$)	Magnitude of Trade – Scenario-C (1,000 US\$)
Canada→Panama	-2.841a (0.215)	0.566	0.059	0.033	74.7	1,558.5	2,824.1
Canada→Philippines	-2.214a (0.195)	0.784	0.110	0.087	591.1	17,351.8	22,657.8
Canada→Russia	-3.242a (0.228)	0.563	0.040	0.023	4,981.5	154,861.2	279,370.2
Canada→Saudi Arabia	-1.678a (0.250)	0.887	0.189	0.169	517.4	17,409.8	20,069.7
Canada→Vietnam	-3.690a (0.306)	0.714	0.025	0.018	9.9	959.1	1,351.1
Canada→United Arab Emirates	-3.536a (0.274)	0.887	0.030	0.026	31.0	8,034.8	9,064.3

Implications of Decreases in Trade Barriers Facing Beef Exporting Countries for Canada's Bilateral Beef Exports (Scenario-D)



	(1)	(2)	(3)	(4)	(5)	(6)
	Bovine Cuts Bone-In, Fresh or Chilled			Bovine Cuts Boneless, Fresh or Chilled		
	Magnitude of Trade – Scenario-D	Magnitude of Trade – Scenario-D (1,000 US\$)	Change (1,000 US\$)	Magnitude of Trade – Scenario-D	Magnitude of Trade – Scenario-D (1,000 US\$)	Change (1,000 US\$)
Canada → Germany	0.029	3,516.4	-1,421.2	0.008	153,764.6	-95,643.1
Canada → Italy	0.046	1,685.3	-741.2	0.040	27,920.4	-17,861.4
Canada → Japan	0.058	1,495.1	-881.0	0.039	369,197.1	-291,665.0
Canada → Mexico	2.015	1,552.8*	-739.6*	3.249	72,566.1*	-20,776.6*
Canada → Rep. of Korea	0.027	11,029.3	-6,674.2	0.011	57,470.1	-40,197.1
Canada → Switzerland	0.149	1,001.3	-1,119.5	0.121	26,343.2	-35,002.7
Canada → United States	2.827	50,389.9*	-12,257.6*	1.462	248,504.4*	-80,583.5*



Implications of Decreases in Trade Barriers Facing Beef Exporting Countries for Canada's Bilateral Beef Exports (Scenario-D)

	(1)	(2)	(3)	(4)	(5)	(6)
	Bovine Cuts Bone-In, Fresh or Chilled			Bovine Cuts Boneless, Fresh or Chilled		
	Magnitude of Trade – Scenario-D	Magnitude of Trade – Scenario-D (1,000 US\$)	Change (1,000 US\$)	Magnitude of Trade – Scenario-D	Magnitude of Trade – Scenario-D (1,000 US\$)	Change (1,000 US\$)
Canada→China	**	**	**	0.008	4,970.4	-1,896.9
Canada→Russia	0.049	1,108.3	-637.7	0.003	4,291.9	-2,446.1
Canada→Saudi Arabia	0.251	436.4	-341.2	0.060	7,467.7	-6,012.4
Canada→United Arab Emirates	0.174	2,694.5	-2,019.3	0.071	9,304.7	-7,005.8



Implications of Decreases in Trade Barriers Facing Beef Exporting Countries for Canada's Bilateral Beef Exports (Scenario-D)

	(1)	(2)	(3)	(4)	(5)	(6)
	Bovine Cuts Bone-In, Frozen			Bovine Cuts Boneless, Frozen		
	Magnitude of Trade – Scenario-D	Magnitude of Trade – Scenario-D (1,000 US\$)	Change (1,000 US\$)	Magnitude of Trade – Scenario-D	Magnitude of Trade – Scenario-D (1,000 US\$)	Change (1,000 US\$)
Canada → Germany	**	**	**	0.004	32,250.1	-13,869.6
Canada → Italy	**	**	**	**	**	**
Canada → Japan	0.041	5,944.8	-4,695.8	0.182	201,048.0	-172,679.5
Canada → Mexico	1.978	199.3*	-77.5*	0.397	3,242.1	-1,878.4
Canada → Rep. of Korea	0.058	101,470.3	-73,375.8	0.024	121,744.6	-78,752.9
Canada → Switzerland	**	**	**	0.003	11,958.6	-17,148.6
Canada → United States	2.361	9,046.4*	-2,189.8*	0.089	500,546.8	-154,473.5



Implications of Decreases in Trade Barriers Facing Beef Exporting Countries for Canada's Bilateral Beef Exports (Scenario-D)

	(1)	(2)	(3)	(4)	(5)	(6)
	Bovine Cuts Bone-In, Frozen			Bovine Cuts Boneless, Frozen		
	Magnitude of Trade – Scenario-D	Magnitude of Trade – Scenario-D (1,000 US\$)	Change (1,000 US\$)	Magnitude of Trade – Scenario-D	Magnitude of Trade – Scenario-D (1,000 US\$)	Change (1,000 US\$)
Canada→China	**	**	**	0.439	82,715.8	-38,546.0
Canada→Russia	0.289	1,072.5	-458.1	0.031	198,074.5	-81,295.7
Canada→Saudi Arabia	0.532	2,242.2	-2,378.6	0.278	10,556.8	-9,512.9
Canada→United Arab Emirates	0.010	605.2	-509.7	0.044	5,315.3	-3,749.0



Where Are The Biggest Opportunities?

annual avg (1,000 US\$)	Scenario A - Tariffs	Scenario B – Non-Tariff Barriers	Scenario C - Both	Scenario D – Multi
Germany	2,920.5	100,653.0	300,465.1	189,531.1
Italy	2,220.5	16,670.4	48,208.4	29,605.7
Japan	64,396.2	506,192.6	1,047,626.3	577,685.0
Rep. of Korea	14,728.7	203,051.5	490,714.3	291,417.3
Switzerland	18,608.3	9,376.9	92,573.9	39,303.1
United States	0	312,750.8	303,717.7†	238,024.2
China	14,905.2	86,037.1	128,129.2	87,686.2
Mexico	0	5,120.4	2,602.9†	3,242.1
Russia	5,518.1	160,754.4	289,384.8	204,547.2
Saudi Arabia	862.5	35,381.8	38,947.1	20,703.1
United Arab Emirates	32.0	3,023.2	31,203.2	17,919.7



Extensive Margins of Trade

- The estimated coefficients from the inflation equations are used to assess the implications of tariffs and non-tariff barriers for the probabilities of Canada to export beef products to group G1's countries (*i.e.*, OECD countries) and to group G2's countries (*i.e.*, non-OECD countries).
- The marginal effects are determined for continuous changes in tariffs and for discrete changes in non-tariff binary variables.
- In the case of bovine cuts bone-in, fresh or chilled, the results show that a 10% increase in tariff rates is associated with a decrease in the probability of establishing a bilateral exporting relationship by 0.75 percentage points, *ceteris paribus*.
- The results indicate that non-tariff barriers are associated with lower probabilities of Canada to export this beef product to group G1's countries and group G2's countries by 5.6 and 7.2 percentage points relative to the corresponding probabilities of other primary beef exporting countries, respectively, *ceteris paribus*.



Extensive Margins of Trade

- In the case of bovine cuts boneless, fresh or chilled, the results show that a 10% increase in tariff rates leads to a decrease in the probability to export by 0.92 percentage points, *ceteris paribus*.
- Also, the results reveal that non-tariff barriers are associated with lower probabilities of Canada to export this beef product to group G1's countries and group G2's countries by 4.3 and 8.7 percentage points relative to the corresponding probabilities of other primary beef exporting countries, respectively, *ceteris paribus*.
- In the case of bovine cuts bone-in, frozen, the results show that a 10% increase in tariff rates is associated with a decrease in the probability to export by 1.24 percentage points, *ceteris paribus*.
- Also, the results indicate that non-tariff barriers are associated with lower probabilities of Canada to export this beef product to group G1's countries and group G2's countries by 5.8 and 13.2 percentage points relative to the corresponding probabilities of other primary beef exporting countries, respectively, *ceteris paribus*.



Extensive Margins of Trade

- In the case of bovine cuts boneless, frozen, the results show that a 10% increase in tariff rates leads to a decrease in the probability to export by 1.08 percentage points, *ceteris paribus*.
- The results reveal that non-tariff barriers are associated with lower probabilities of Canada to export this beef product to group G1's countries and group G2's countries by 4.9 and 9.6 percentage points relative to the corresponding probabilities of other primary beef exporting countries, respectively, *ceteris paribus*.



Concluding Remarks

- This study indicates that policy-makers and stakeholders should pursue individually-tailored exporting strategies across different destination markets.
- This study implies that policy-makers and stakeholders should adopt strategies aiming at enhancing exports to some countries through concomitant reductions in both tariffs and non-tariff trade barriers, rather than focusing on reducing one type of trade barriers. This strategy could be simpler to pursue through negotiations, and could have stronger impact on increasing trade flows due to the interactive nature of trade barriers.
- This study also indicates that developed countries remain the principal markets for Canada's beef exports, where decreases in trade barriers would have significant impacts on trade flows. Also, it underlines significant opportunities for Canada's beef exports to some developing countries, including China and Russia.



Concluding Remarks

- There are intermediate markets opportunities in other developing countries (*e.g.*, China, Russia, GCC countries), amounting to important trade values.
- The significance of reducing trade barriers facing Canada's beef exports would be lessening when complemented by reductions in trade barriers facing other major beef exporting countries.
- The implications NAFTA preferences for Canada beef exports to the United States and Mexico could be partly dissipated when other primary beef exporting countries (*e.g.*, Australia, Brazil) establish stronger trading relationships with these NAFTA countries.
- In the case of developing countries, expressing reductions in trade barriers into higher increases of trade flows in value terms await growth in the market size of destination countries, and improvements in demand conditions and consumption factors (higher income, changing traditional diet to include more beef, and changing affinity toward beef *vis-à-vis* other meat products).

University of
Lethbridge



Thank You

Questions?