Impacts of Country-of-Origin Labeling (COOL) on U.S. Import Demand for Meat Products: SD-AIDS Model Approach

.

Cephas Naanwaab[1], Osei Yeboah[1], and Saleem Shaik[2]

[1] North Carolina A&T State University

[2] North Dakota State University

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Outline

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Overview of U.S. COOL Statute

- Farm Security and Rural Investment Act of 2002 (2002 Farm Bill)
- Initially voluntary beginning September 30, 2002
- Mandatory September 30, 2004
- Covered Commodities: beef, pork, lamb, fish and shellfish, fruits and vegetables, and peanuts
- January 2004: Implementation suspended over industry concerns, negotiations continued
- Amended in the Food, Conservation and Energy Act of 2008 (2008 Farm Bill)
- included chicken, goat meat, macadamia nuts, pecans, and ginseng
- Final implementation date: September 30, 2008
- Final rule issued: March 16, 2009

Motivations of the study

- MCOOL opponents especially Canada and Mexico claimed that the law unfairly targeted their products
- December 2008: Canada and Mexico filed dispute settlement proceedings with the WTO challenging U.S. COOL law on meat products
- Their complaint: U.S. COOL statute and its implementation unfairly discriminated Canadian and Mexican meat exports to the U.S.
- A WTO Panel ruled in November 2011that the U.S. had the right, under WTO rules, to adopt COOL requirements on meat products

Motivations of the study

- The panel disagreed with the manner in which the U.S. designed and implemented its COOL statute.
- In the Panel's view U.S. may have violated the agreement on TBTs
- The U.S. subsequently appealed against this finding in March 2012
- A WTO Appellate Body affirmed (29 June, 2012) U.S.right to adopt COOL on meat products
- However it upheld the earlier ruling that the manner of implementation may have violated TBT agreement
- In the Appellate Body's words COOL "accords less favorable treatment to imported Canadian cattle and hogs than to like domestic cattle and hogs."

Research Objectives

- What has been the effect of MCOOL on U.S. demand for imported meat products?

- Does MCOOL constitute a 'technical barrier to trade' as alleged by U.S. trading partners?

- Objectives
  - Analyze impact of MCOOL on U.S. meat import demand from major trading partners.
  - Compute elasticities of import demand both prior to and after COOL requirements were enforced

Methods

- Import Demand Analysis
  - Source-Differentiated AIDS Model (SD-AIDS)

Each meat product is differentiated by source country

Beef: Australia, Canada, Mexico, New Zealand Nicaragua, Uruguay

Pork: Canada, Denmark

Lamb: Australia, New Zealand

SD-AIDS model

$$w_{ih} = \alpha_{ih} + \sum_j \sum_k \gamma_{i_h j_k} \ln(p_{jk}) + \beta_{ih} ln\left(\frac{Y}{P}\right) + \alpha_{ihm} D_m$$

$$\ln(Y) = \sum_i \sum_h \ln(p_{ih}) * \ln(q_{ih})$$

$$\ln(P) = \sum_i \sum_h \widetilde{w}_{ih} \ln(p_{ih})$$

Model Restrictions

Adding-up: $\sum_i \sum_h \alpha_{ih} = 1; \quad \sum_i \sum_h \gamma_{i_h j_k} = 0 ; \quad \sum_i \sum_h \beta_{ih} = 0$

Homogeneity: $\sum_j \sum_k \gamma_{i_h j_k} = 0$

Symmetry: $\gamma_{i_h j_k} = \gamma_{j_k i_h}$

Elasticities are computed as follows

Expenditure elasticity:

$$\eta_{ih} = \beta_{ih} / w_{ih} + 1$$

Marshallian price elasticity

$$\varepsilon_{i_h j_k} = -\delta_{i_h j_k} + \frac{\gamma_{i_h j_k}}{w_{ih}} - \beta_{ih} \frac{w_{jk}}{w_{ih}}$$

Impulse Response

- We specify an impulse response model to test the impact of MCOOL on import demand for each meat product type and source
- similar to intervention analysis model of
- Enders, Sandler, and Cauley (1990), and Enders (2004)

$$x_t = a_0 + a_1 x_{t-1} + c_0 z_t + \varepsilon_t \qquad |\alpha_1| < 1$$

Z_t { =0 prior to 2009:3 ; =1 from 2009:3

C_0: Initial/impact effect of COOL on meat import demand

$C_0/(1 - \alpha_1)$: Long-run effect of COOL

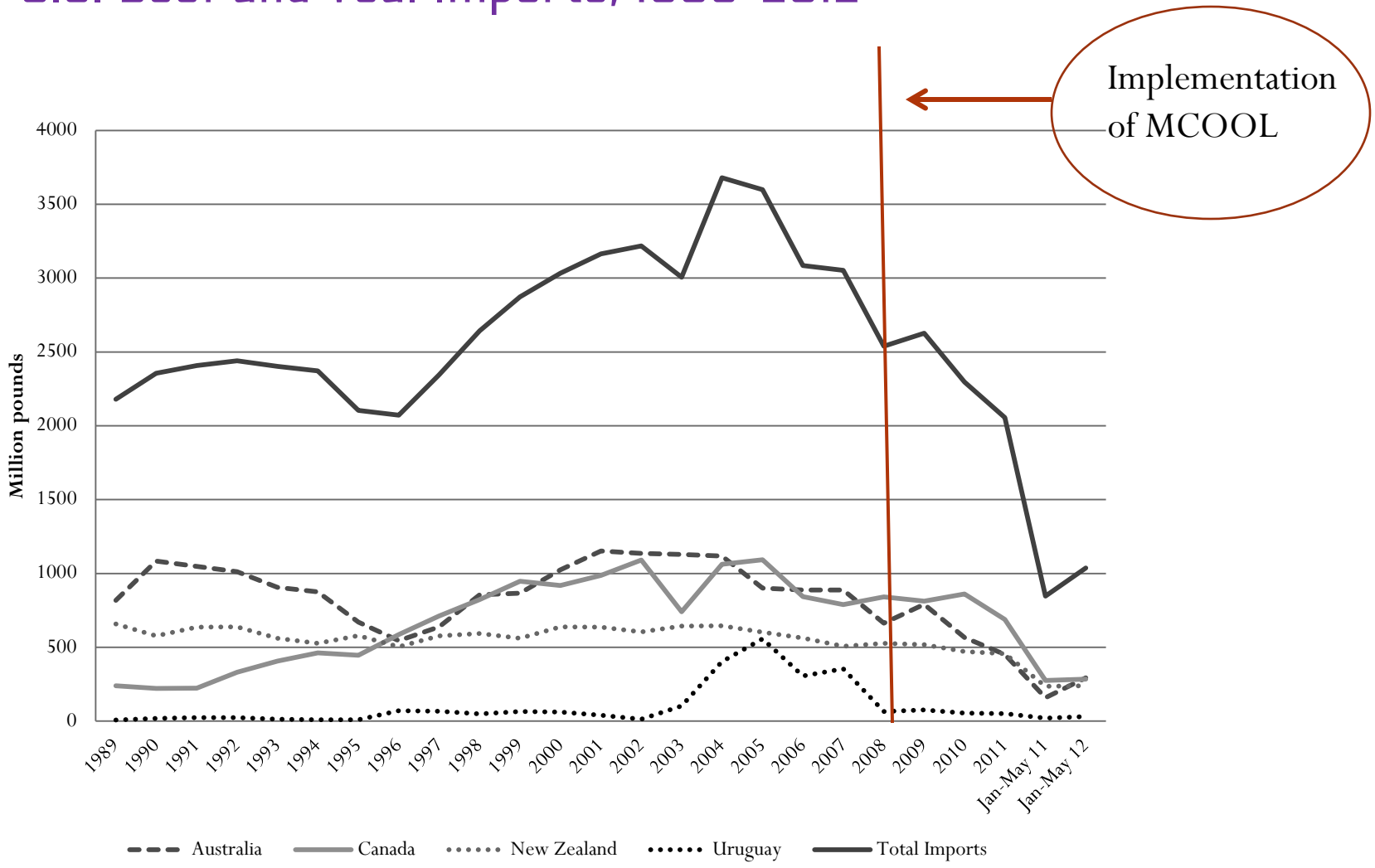
Maybe generalized to include any number of ARMA (p, q) processes

$$x_t = a_0 + A(L)x_{t-1} + c_0 z_t + B(L)\varepsilon_t$$

Data

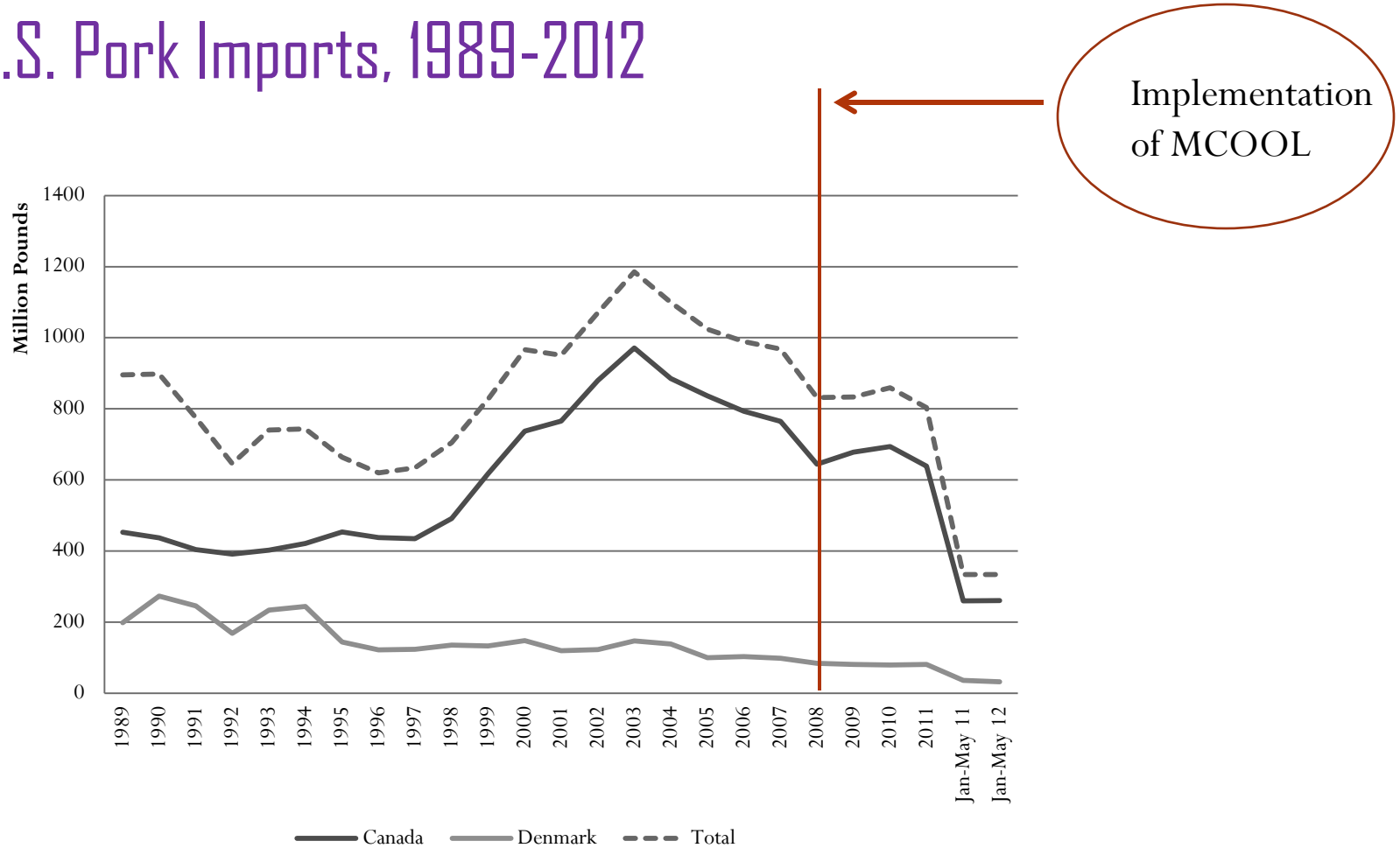
- Monthly data on meat products imports (1989-2012)
- Including beef (including veal), pork (frozen and chilled), and lamb
- Chicken left out because U.S. does not import significant quantities
- The data are from USDA Foreign Agricultural Service (GATS database)
- Meat products differentiated by source i.e. Canada, Mexico, Australia, Uruguay, Nicaragua, Denmark, and New Zealand

U.S. Beef and Veal Imports, 1989-2012



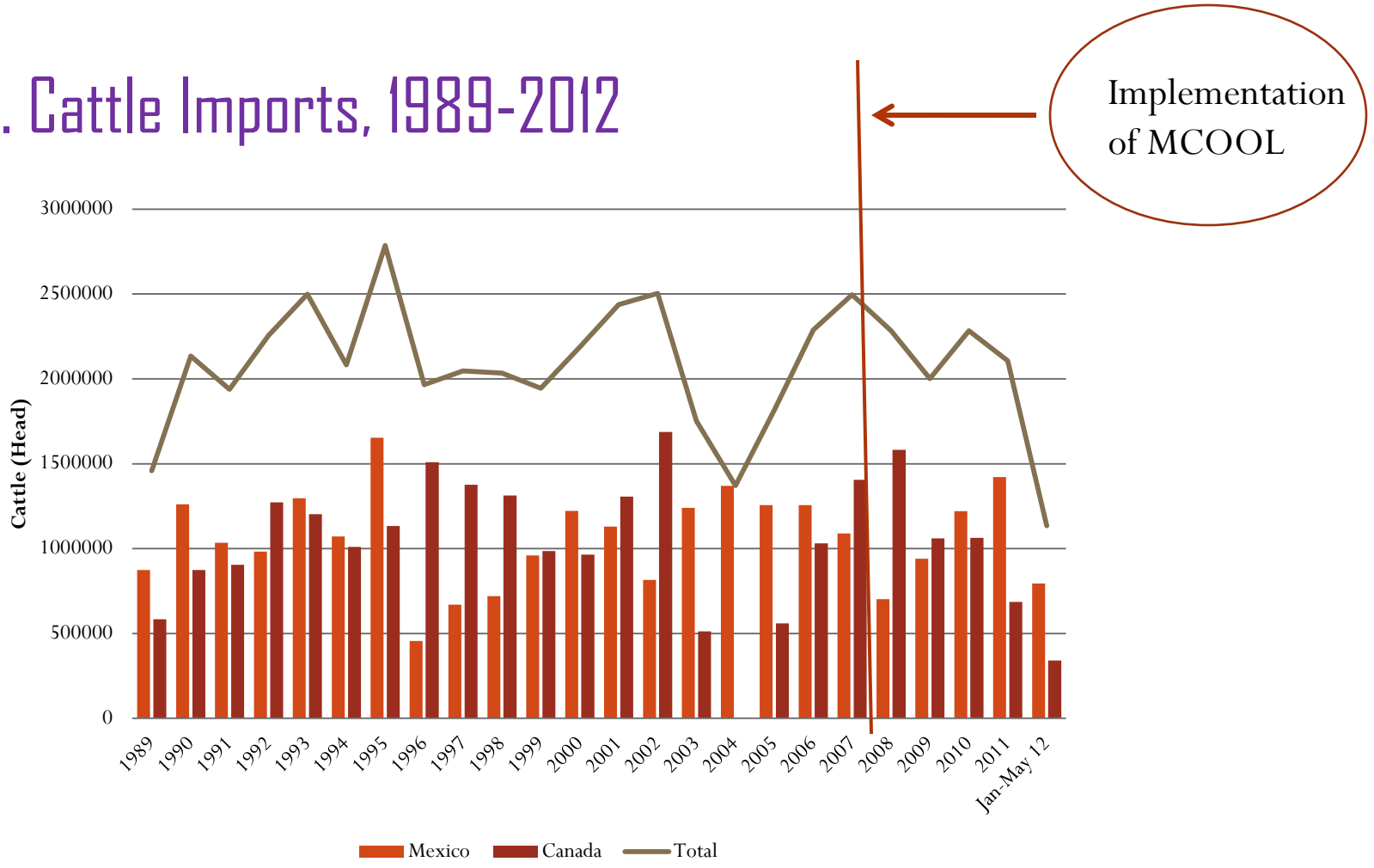
Data source: USDA Foreign Agricultural Service (GATS database)

U.S. Pork Imports, 1989-2012



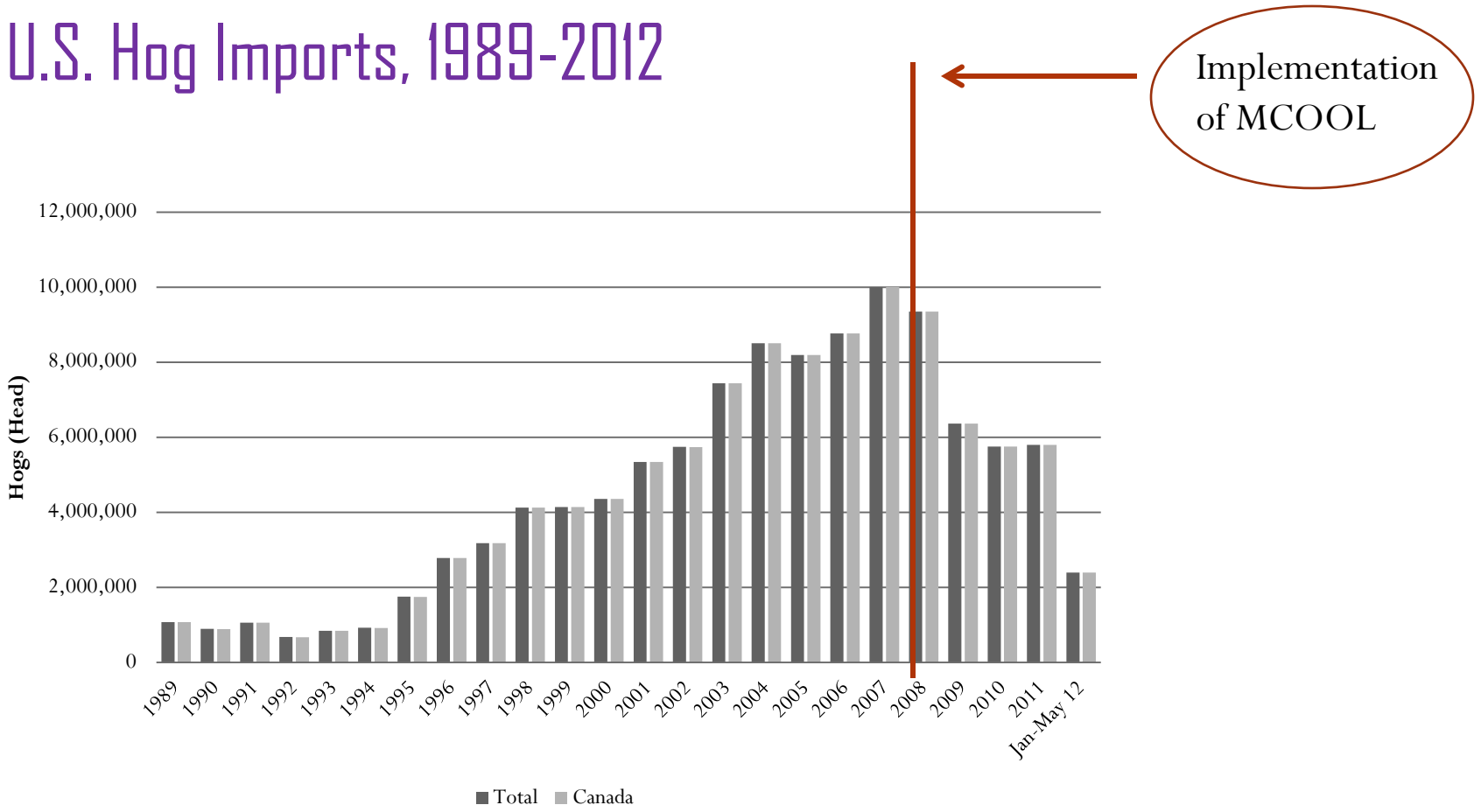
Data source: USDA Foreign Agricultural Service (GATS database)

U.S. Cattle Imports, 1989-2012



Data source: USDA Foreign Agricultural Service (GATS database)

U.S. Hog Imports, 1989-2012



Data source: USDA Foreign Agricultural Service (GATS database)

Estimation Results

Table 1: Parameter Estimates of SD-AIDS model with homogeneity and symmetry restrictions

	Share Equations for Beef Imports					
Explanatory Variables	Australia	Canada	Mexico	New Zealand	Nicaragua	Uruguay
Beef Prices						
Australia	-0.288***					
	(0.065)					
Canada	-0.098***	-0.006				
	(0.026)	(0.020)				
Mexico	0.037***	0.0007	-0.007			
	(0.011)	(0.005)	(0.006)			
N. Zealand	0.199***	0.039*	0.014	-0.289***		
	(0.055)	(0.023)	(0.012)	(0.062)		
Nicaragua	0.036***	0.001	-0.013***	-0.007	0.021***	
	(0.007)	(0.003)	(0.004)	(0.008)	(0.006)	
Uruguay	0.056***	-0.016*	0.011***	0.052***	0.0008	-0.103***
	(0.017)	(0.008)	(0.003)	(0.015)	(0.002)	(0.007)

Estimation Results

Pork Prices						
Canada	-0.015	0.088***	-0.008	0.057**	-0.026***	-0.007
	(0.027)	(0.014)	(0.007)	(0.028)	(0.004)	(0.009)
Denmark	0.002	0.026***	-0.035***	-0.028*	-0.005	0.005
	(0.013)	(0.006)	(0.005)	(0.013)	(0.004)	(0.004)
Lamb Prices						
Australia	0.074***	-0.041***	-0.004	-0.033*	-0.003	0.001
	(0.020)	(0.009)	(0.005)	(0.019)	(0.003)	(0.006)
N. Zealand	-0.003	0.004	0.005	-0.004	-0.005*	-0.0003
	(0.012)	(0.005)	(0.003)	(0.012)	(0.002)	(0.003)
Expenditure	0.010***	0.015***	0.001***	0.008***	0.001***	0.001***
	(0.0008)	(0.0004)	(0.0002)	(0.0008)	(0.0001)	(0.0002)
COOL	-0.076***	-0.010	0.029***	0.007	0.009***	0.013**
	(0.014)	(0.011)	(0.003)	(0.012)	(0.001)	(0.005)

Notes: Single, double, and triple asterisks (*) denote statistical significance at the 10%, 5%, and respectively. Numbers in parentheses are asymptotic standard errors.

Estimation Results

Explanatory Variables	Pork		Lamb
	Canada	Denmark	Australia
Canada	-0.039*		
	(0.022)		
Denmark	-0.017**	0.059***	
	(0.008)	(0.008)	
Lamb			
Australia	-0.026**	0.006	0.013
	(0.011)	(0.006)	(0.012)
N. Zealand	-0.005	-0.013***	0.013**
	(0.007)	(0.004)	(0.005)
Expenditure	0.011***	0.002***	0.002***
	(0.0005)	(0.0002)	(0.0003)
COOL	0.020***	-0.003	0.012**
	(0.007)	(0.003)	(0.005)

Estimation Results

Table 2: Source-differentiated Marshallian Elasticities of U.S. meat import demand: Pre-COOL

	Beef					
Explanatory Variables	Australia	Canada	Mexico	New Zealand	Nicaragua	Uruguay
Beef Prices						
Australia	-2.475***	-0.390***	2.312***	1.956***	3.114***	2.220***
	(0.343)	(0.114)	(0.686)	(0.482)	(0.653)	(0.490)
Canada	-0.452***	-0.999***	-1.659***	0.378**	0.029	-0.378
	(0.133)	(0.091)	(0.290)	(0.186)	(0.273)	(0.246)
Mexico	0.136***	-0.085***	0.942**	-0.172**	-0.798**	0.208***
	(0.040)	(0.015)	(0.377)	(0.070)	(0.315)	(0.068)
N. Zealand	1.171***	0.195**	-1.720**	-3.289***	-0.609	0.811*
	(0.288)	(0.095)	(0.712)	(0.523)	(0.771)	(0.436)
Nicaragua	0.183***	0.002	-0.787**	-0.059	0.136	0.002
	(0.038)	(0.013)	(0.311)	(0.075)	(0.571)	(0.067)
Uruguay	0.392***	-0.057	0.622***	0.239*	0.004	-4.198***
	(0.086)	(0.037)	(0.204)	(0.129)	(0.202)	(0.228)

Pork Prices						
Canada	-0.237*	0.371***	-0.687	0.599***	-1.375***	0.108
	(0.133)	(0.059)	(0.403)	(0.226)	(0.411)	(0.256)
Denmark	-0.037	0.071***	-0.219	-0.261*	-0.987**	0.238*
	(0.074)	(0.039)	(0.431)	(0.130)	(0.472)	(0.186)
Lamb						
Australia	0.269**	-0.178***	0.012	-0.399**	-0.292	0.132
	(0.107)	(0.039)	(0.336)	(0.164)	(0.335)	(0.186)
N. Zealand	-0.0005	0.010	0.191	-0.067	-0.331	-0.195*
	(0.057)	(0.020)	(0.246)	(0.100)	(0.253)	(0.100)
Expenditure	1.048***	1.061***	0.993***	1.075***	1.109***	1.049***
	(0.003)	(0.002)	(0.014)	(0.006)	(0.014)	(0.007)

Notes: Single, double, and triple asterisks (*) denote statistical significance at the 10%, 5%, and 1% respectively. Numbers in parentheses are asymptotic standard errors.

	Pork		Lamb	
Explanatory Variables	Canada	Denmark	Australia	New Zealand
Beef Prices				
Australia	-0.252*	-0.173	0.979**	-1.157
	(0.142)	(0.347)	(0.386)	(0.846)
Canada	0.459***	0.399***	-0.744***	1.696**
	(0.073)	(0.148)	(0.167)	(0.761)
Mexico	-0.044*	-0.061	0.002	0.157
	(0.025)	(0.120)	(0.072)	(0.095)
N. Zealand	0.382***	-0.729*	-0.855**	-0.149
	(0.143)	(0.366)	(0.353)	(0.705)
Nicaragua	-0.084***	-0.271**	-0.060	-0.158*
	(0.025)	(0.130)	(0.071)	(0.088)
Uruguay	0.020	0.199*	0.085	0.872***
	(0.048)	(0.105)	(0.118)	(0.298)

Pork Prices				
Canada	-1.313***	-0.398*	-0.389*	-0.636*
	(0.112)	(0.217)	(0.207)	(0.360)
Denmark	-0.090*	0.304	-0.006	-0.364*
	(0.049)	(0.286)	(0.127)	(0.213)
Lamb				
Australia	-0.115*	-0.008	-0.367	1.481***
	(0.061)	(0.166)	(0.232)	(0.301)
N. Zealand	-0.014	-0.298**	0.329***	-2.284***
	(0.347)	(0.124)	(0.095)	(0.05)
Expenditure	1.053***	1.038***	1.027***	0.544***
	(0.002)	(0.007)	(0.006)	(0.151)

Notes: Single, double, and triple asterisks (*) denote statistical significance at the respectively. Numbers in parentheses are asymptotic standard errors.

Table 3: Source-differentiated Marshallian Elasticities of U.S. meat import demand: Post-COOL implementation

	Beef					
Explanatory Variables	Australia	Canada	Mexico	New Zealand	Nicaragua	Uruguay
Beef Prices						
Australia	-3.185***	-0.120	1.142***	0.969	1.513***	-2.115***
	(0.655)	(0.291)	(0.391)	(0.874)	(0.546)	(0.764)
Canada	-0.138	-0.868**	1.825***	-0.120	0.135	0.206
	(0.336)	(0.323)	(0.356)	(0.586)	(0.626)	(0.696)
Mexico	0.361***	0.496***	-2.297***	0.169	-1.755***	0.353
	(0.123)	(0.097)	(0.193)	(0.207)	(0.269)	(0.293)
N. Zealand	0.735	0.081	0.403	-2.811**	-1.611**	3.395***
	(0.666)	(0.386)	(0.500)	(1.308)	(0.759)	(0.982)
Nicaragua	0.237***	0.019	-0.868**	-0.328**	2.396***	-0.016
	(0.085)	(0.084)	(0.133)	(0.155)	(0.548)	(0.255)
Uruguay	-0.263***	0.022	0.139	0.557***	-0.013	-1.059***
	(0.095)	(0.075)	(0.116)	(0.161)	(0.204)	(0.333)

Pork Prices						
Canada	0.648**	-0.152***	-0.967***	-0.013	-1.695***	-0.898
	(0.302)	(0.243)	(0.306)	(0.599)	(0.583)	(0.660)
Denmark	-0.095	-0.282***	-0.490	0.411**	0.608**	-0.361
	(0.096)	(0.082)	(0.151)	(0.163)	(0.262)	(0.258)
Lamb						
Australia	0.481**	-0.043	-0.063	0.333	-0.406	-0.649*
	(0.229)	(0.143)	(0.186)	(0.380)	(0.319)	(0.363)
N. Zealand	0.175	-0.039	0.111	-0.200	-0.280	0.084
	(0.149)	(0.092)	(0.114)	(0.273)	(0.175)	(0.225)
Expenditure	1.044***	1.049***	1.065***	1.031***	1.110***	1.061***
	(0.013)	(0.009)	(0.011)	(0.023)	(0.019)	(0.021)

Notes: Single, double, and triple asterisks (*) denote statistical significance at the 10%, 5%, and respectively. Numbers in parentheses are asymptotic standard errors.

Explanatory Variables	Pork		Lamb	
	Canada	Denmark	Australia	New Zealand
Beef Prices				
Australia	0.570**	-0.477	0.931**	3.180***
	(0.296)	(0.477)	(0.442)	(0.793)
Canada	-0.162	-1.625***	-0.098***	-2.002***
	(0.251)	(0.471)	(0.320)	(0.629)
Mexico	-0.271***	-0.764***	-0.038	0.241
	(0.086)	(0.236)	(0.113)	(0.252)
N. Zealand	-0.014	1.544**	0.488	-0.971
	(0.407)	(0.613)	(0.558)	(1.037)
Nicaragua	-0.233***	0.470**	-0.121	-0.201
	(0.081)	(0.202)	(0.096)	(0.159)
Uruguay	-0.099	-0.223	-0.156	0.066
	(0.073)	(0.159)	(0.087)	(0.179)
Pork Prices				
Canada	-1.504	-0.335	-0.731**	-0.577
	(0.300)	(0.418)	(0.308)	(0.587)
Denmark	-0.060	0.801	-0.148	0.005
	(0.075)	(0.256)	(0.090)	(0.184)
Lamb				
Australia	-0.337**	-0.380	-1.173	-0.135
	(0.142)	(0.232)	(0.311)	(0.606)
N. Zealand	0.039	-0.074	0.002	-0.682***
	(0.102)	(0.144)	(0.137)	(0.023)
Expenditure	1.073***	1.063***	1.049***	1.077
	(0.010)	(0.013)	(0.014)	(0.651)

Notes: Single, double, and triple asterisks (*) denote statistical significance at the 10%, 5%, respectively. Numbers in parentheses are asymptotic standard errors.

Impulse Response Analysis

Table 4: Impulse Response Function

Response variables	Impact Effect	Long-run Effect
Beef from		
Australia	-0.460***	-0.662
	(0.171)	
Canada	-0.214	-0.135
	(0.269)	
Mexico	0.043	0.046
	(0.181)	
Nicaragua	0.047	0.033
	(0.102)	
New Zealand	0.023	0.033
	(0.121)	
Uruguay	0.028	0.026
	(0.105)	
Pork from		
Canada	-0.010	-0.007
	(0.012)	
Denmark	-0.305***	-0.639
	(0.090)	
Lamb from		
Australia	-0.011	-0.008
	(0.041)	
New Zealand	0.043	0.105
	(0.086)	

Standard errors in parentheses

Concluding Remarks

- The share of beef imported from Australia has declined
- while the shares of beef from Mexico, Nicaragua, Uruguay have increased
- Share of pork from Canada increased
- Share of lamb from Australia increased

- Initial impact of COOL led to decline in import of beef from Australia and decline in pork import from Denmark

- Pre/post analysis shows that expenditure elasticities have not shifted following implementation of MCOOL

- Mandatory COOL appears to have had mixed effect on U.S. import demand based on the source origin of each meat product