The Effects of TTIP Market Access Reform on EU Beef Import Demand

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Outline

1. Importance of eliminating NTM restrictions and the binding TRQ on EU beef imports

2. US production practices and US/EU Beef Trade

3. Modeling of EU beef import demand

4. Effects of Eliminating the NTM on EU beef imports and Expanding the Beef TRQ

5. Conclusions

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Purpose and Study Overview

- What are the potential effects of removing the EU ban on hormone beef and increasing market access for imported beef from all sources?

- EU currently bans imports on meat products using commercial production practices that are common in the U.S. and maintains a binding TRQ that limits beef imports from all sources.

- EU is one of the world's largest producers and consumers of beef.

- We estimate EU demand for imported beef differentiated by product and country of origin.

- Demand is modeled as firm demand; differential approach to firm theory is used.

- Estimates are used to project the impact of eliminating the NTM as well as an expansion of the TRQ.

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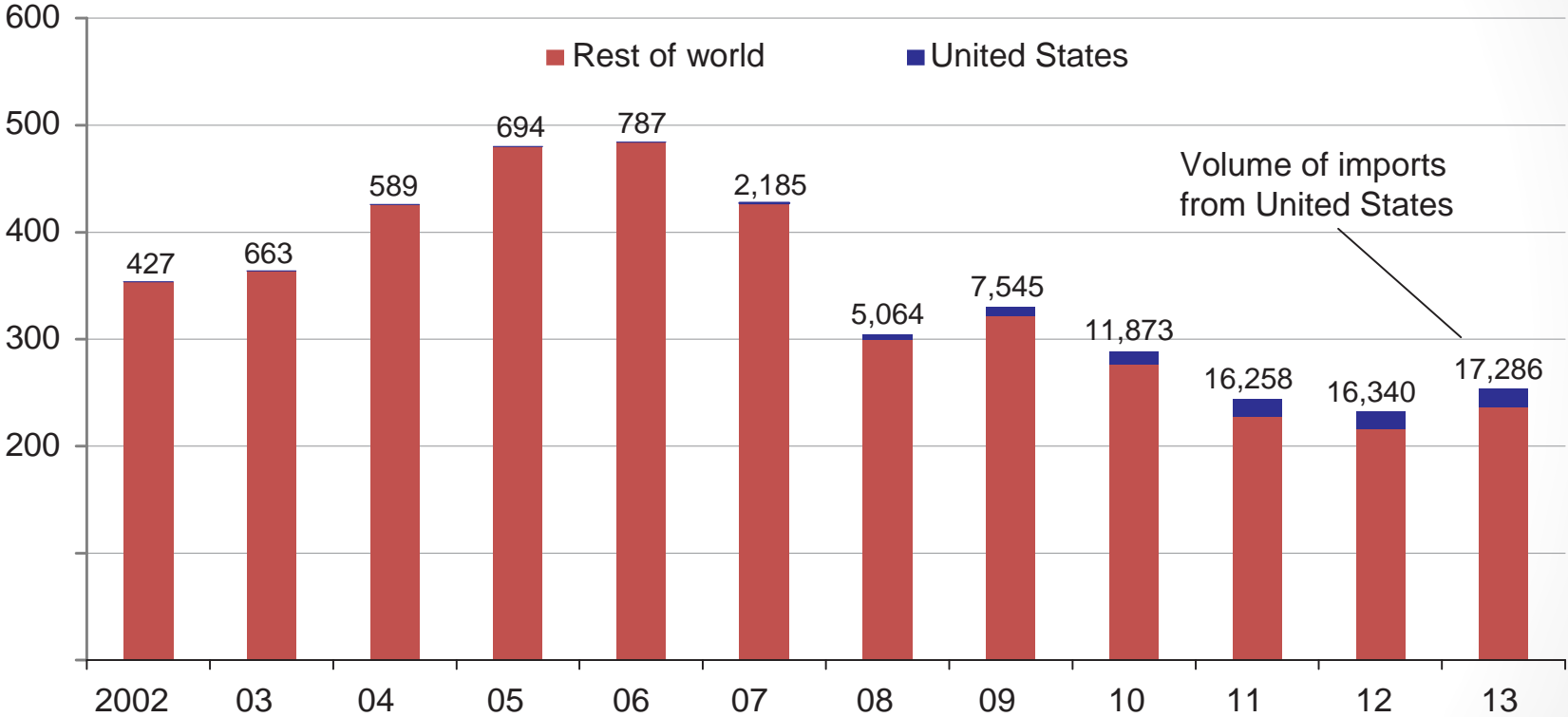
Agriculture and TTIP

- EU is one of the world's largest producers and consumers of beef, pork, and poultry

- EU TRQ and SPS policies continue to limit imports of U.S. meats

- Both the EU and the U.S. have relatively low tariffs on goods

- The EU has higher tariffs on agricultural products

- For agriculture, the trade-weighted tariffs are an estimated 8.6% for EU imports from the US and 2.1% for US imports from the EU (Akhtar and Jones, 2013)

- EU has been more selective in including agricultural products in PTA negotiations, while the US has been more comprehensive in its level of liberalization in PTAs (Grueff, 2013)

- TRQs and SPS measures in beef, pork, poultry and other agricultural products are key negotiating points for US agriculture

U.S. Beef Production Technology

- Growth promoting hormones have been used safely in the US since the 1950s and are also approved for use in Australia, Canada, and New Zealand.
- 84% of cattle in large feedlots in the U.S. were implanted with hormones in 2011 (APHIS, 2013).
- Hormones increase muscle growth and decrease fat deposition in the carcass
- Hormones increase average daily gain by 14.1%, and improve feed efficiency by 8.8%
- This decreases productions costs by approximately $68.59 per head
- Beta-agonists were approved in the U.S. for livestock use in 1999 and were banned by the EU in 2006
- In 2011, 57% of cattle in U.S. feedlots were administered one of the two commercially available beta-agonists approved for use (APHIS, 2013).
- Found to improve average daily gain by 14% and feed efficiency by 12.6%.
- Beta-agonists reduce production costs by $13.02 per head.

Source: USDA, ERS: http://www.ers.usda.gov/media/1712394/ldpm-245-01.pdf

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EU beef imports from the United States and rest of world

Metric tons (thousands)

Source: USDA, ERS using data from Global Trade Atlas, 2014.

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Data

- Monthly import data, Jan. 2010–Dec. 2015 (World Trade Atlas ® database)

- Trade is disaggregated by origin and product (Chilled beef from Argentina, Australia, Brazil, Uruguay, U.S., and ROW: frozen beef from Brazil and ROW)

- HS 0201 *Meat of Bovine Animals, Fresh or Chilled*

- HS 0202 *Meat of Bovine Animals, Frozen*.

- Quantities measured in kilograms and *cif* prices in $US per kg

- 12th differenced ($\Delta x = x_t - x_{t-12}$) the data to remove seasonality; added constant terms for trend effects; price homogeneity and symmetry tested and imposed; corrected for AR(1) (Beach and MacKinnon, 1979).

EU Beef Imports

EU beef imports and market share (%) by exporting country and product
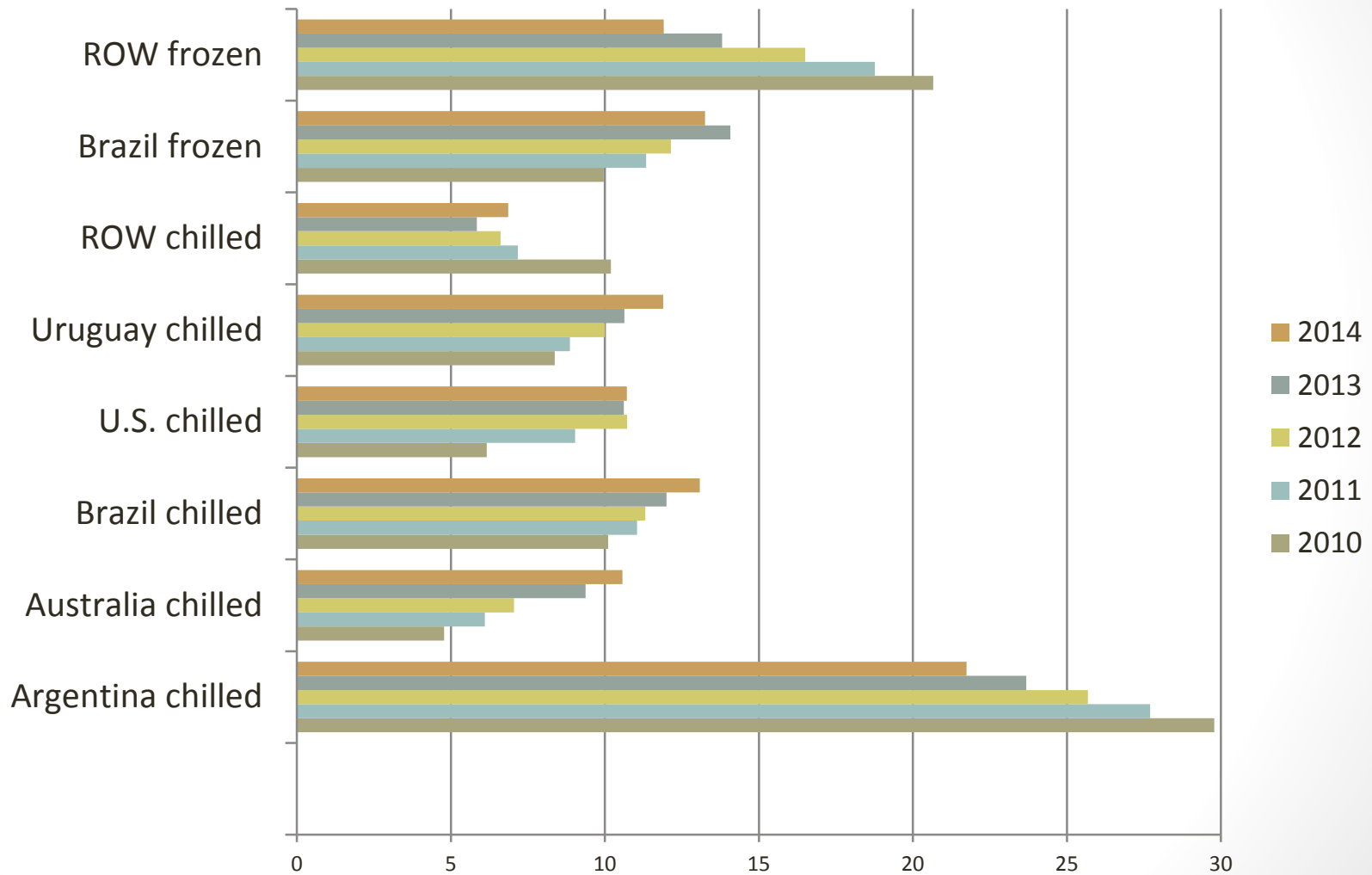
EU Beef Imports

- Total EU imports of chilled and frozen beef have ranged from $1.73 billion in 2010 to $2.18 billion in 2014 (Table 1).

- Five key exporters have dominated the market for chilled and frozen beef during this timeframe, but the level of competitiveness between countries and relative market shares have changed over time.

- While Argentina is overwhelmingly the largest exporter of chilled beef to the EU, imports from Argentina have decreased annually from 29.78% in 2010 to 21.74% of the chilled and frozen market in 2014 (Table 1).

- Increased beef trade from the four other key export competitors: Australia, Brazil, U.S. and Uruguay.

- Brazil is the key exporter of frozen beef to the EU, and the second largest exporter of chilled beef, with growth in both products

- Chilled beef imports from Brazil increased from 10.10% to 13.08%, with frozen imports from Brazil increasing from 9.96% to 13.25%.

- Frozen beef imports from ROW have decreased from 20.66% to 11.91%

- Chilled imports from ROW also decreased from 10.19% to 6.86%

- Decreases in imports from ROW and Argentina allowed for key competitors to gain market share over the four year timeframe.

Estimation

- Past studies that assessed import demand differentiated by source used a utility or consumer-based approach to obtain import demand equations.

- We model beef import demand as input demand, since beef is imported by firms, and use the differential factor allocation model (Laitinen 1980).

- Import demand estimates used to derive conditional demand elasticities that are used to project the effects of removing the hormone ban using an estimated 23% ad-valorem equivalent (AVE) of the non-tariff measure (NTM)

Two scenarios modeled:

1. Estimate impacts of removing the NTM restriction on beef imports related to the hormone ban.

2. Assess impacts of NTM removal in tandem with 50% beef TRQ expansion

- Assess import demand factors in the current state of EU imports of only non-hormone beef vs potential future coexistence of hormone and non-hormone beef

- Conditional demand elasticities only allow for estimating the trade diversion (substitution) effect of a price change.

- We also estimate total import elasticities to account for any trade creation effects, yet all insignificant due to total imports being mostly determined by the TRQ and not by prices.

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Import Demand Model: Estimation and Forecasting

- The differential factor allocation model (DFAM), derived from the differential approach to the theory of the firm (Theil 1980, Laitinen 1980), is used to estimate the demand for imported beef in the EU and is specified as:

$$\bar{f}_{it}Dx_{it} = \theta_i DX_t + \sum_{j-1}^{n} \pi_{ij} Dp_{jt} + \mu_{it}$$

- Note that the importing firm faces the following choice set for beef imports: $i \in$ (*chilled beef*: Argentina, Australia, Brazil, Uruguay, U.S., ROW; *frozen beef*: Brazil, ROW) where ROW is the *rest of the world*

- $Dx_t = \log(x_t) - \log(x_{t-12})$ and $Dp_t = \log(p_t) - \log(p_{t-12})$ = log changes in quantity and price from period t-12 to t

- x_i and p_i = quantity and price of beef imports from the ith exporting source

- $\bar{f}_{it} = (f_{it} + f_{t-12})/2$ where f_i is the ith import share in total import cost, $p_i x_i / \sum_{i-1}^{n} p_i x_i$

- Note that we use monthly data and the 12th difference is used to control for import seasonality

- DX = the finite version of the Divisia volume index $\sum_{i-1}^{n} \bar{f}_{it} D x_{it}$, a measure of change in real aggregate import expenditures

- π_{ij} = conditional price effect measuring the impact of the jth beef price on EU beef imports from the ith country

- θ_i = ith marginal import share $\partial(p_i x_i) / \partial(\Sigma_i p_i x_i)$

- π_{ij} and θ_i treated as fixed parameters to be estimated

- μ_{it} = random disturbance term

Import Demand Model: Estimation and Forecasting

- Mean-based elasticities are calculated using the model estimates as follows:

- Conditional own and cross-price elasticity $\eta_{ij} = \dfrac{Dx_i}{Dp_j} = \dfrac{\pi_{ij}}{\bar{\bar{f}}_i}$

- Divisia index elasticity $\eta_i = \dfrac{Dx_i}{DX} = \dfrac{\theta_i}{\bar{\bar{f}}_i}$

  - Measures the effects of a percentage change in real aggregate expenditures on imports from the various source countries

- Use the elasticity-based forecasting method for the DFAM to simulate the effects of the removal of the hormone ban on EU beef

$$x_{it} = \left(\sum_{j=1}^{n} \eta_{ij} \left[\frac{p_{jt} - p_{jt-12}}{p_{jt-1}} \right] + \eta_i \left[DX_t \right] \right) x_{it-12} + x_{it-12}$$

  - where η_{ij} and η_i are the price and Divisia elasticities

Summary Statistics

	Argentina chilled	Australia chilled	Brazil chilled	U.S. chilled	Uruguay chilled	ROW chilled	Brazil frozen	ROW frozen
Monthly quantity (1,000 metric tons)								
Mean	2.86	1.21	1.78	1.28	1.4	1.41	2.74	3.8
Std. Dev.	0.73	0.52	0.58	0.32	0.36	0.47	0.91	1.35
Min.	1.26	0.32	0.63	0.55	0.69	0.74	0.74	1.78
Max.	6.31	2.59	2.97	2.1	2.24	2.69	5.81	7.59
Monthly value ($ millions)								
Mean	41.95	12.66	19.01	15.67	16.46	11.92	20.08	26.49
Std. Dev.	9.94	5.36	6.2	4.98	4.4	3.4	5.98	8.58
Min.	15.81	3.23	7.91	5.74	7.67	6.2	4.76	14.37
Max.	83.79	26.09	32.59	29.54	27.66	20.12	34.23	58.34
Price ($/kilogram)								
Mean	14.78	10.45	10.79	12.03	11.79	8.57	7.41	7.11
Std. Dev.	1.52	0.69	1.42	1.39	1.23	1.01	0.73	0.93
Min.	10.15	8.43	8.05	8.98	8.43	5.94	5.55	4.88
Max.	17.42	12.17	13.54	14.8	14.72	10.41	9.3	9.2
Value share (%)								
Mean	25.56	7.57	11.46	9.48	9.98	7.38	12.18	16.38
Std. Dev.	4.77	2.68	2.92	2.56	2.1	2.42	2.95	5.3
Min.	13.35	2.1	6.24	4.41	5.42	4.14	3.63	8.84
Max.	43.64	12.81	19.17	15.35	15.41	16.52	18.14	29.75

Summary Statistics

- Argentina was the largest exporter of beef by value and quantity from 2010-2014
- Brazil is the second largest exporter of chilled beef and the key exporter of frozen beef
- From a value perspective, average Argentine exports of chilled beef ($41.95 million) are double the value of both Brazilian chilled ($19.01 million) and frozen ($20.08 million) exports
- Monthly average quantity for Argentine chilled (2,860 mt) similar to Brazil frozen (2,740 mt)
- Prices for chilled beef are relatively higher than frozen beef
- Average Monthly Prices (per kg):
  - Argentina chilled $14.78
  - Brazil chilled $10.79 and frozen $7.41
  - U.S. chilled $12.03
  - Uruguay chilled $11.79
  - Australia chilled $10.45
- Argentine chilled beef is twice as expensive as Brazilian frozen, and $2-$4/kg more than beef from other key exporters to the EU.
- Average monthly value shares:
  - Argentina chilled 25.56%
  - Brazil frozen 12.18%
  - Brazil chilled 11.46%
  - Uruguay chilled 9.98%
  - U.S. chilled 9.48%
  - Australia chilled 7.57%

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Demand Estimates for EU Beef Imports

Country/ product	Marginal share (θ)	Argentina chilled	Australia chilled	Brazil chilled	U.S. chilled	Uruguay chilled	ROW chilled	Brazil frozen	ROW frozen
		Conditional price estimates (π)							
Argentina chilled	0.209**	-0.313**	0.049	0.043	0.023	0.151**	0.044	0.035	-0.033
	(0.067)	(0.084)	(0.037)	(0.037)	(0.047)	(0.042)	(0.029)	(0.042)	(0.047)
Australia chilled	0.081*		-0.169**	-0.060*	0.048	0.029	0.003	0.029	0.071*
	(0.033)		(0.035)	(0.024)	(0.029)	(0.028)	(0.018)	(0.027)	(0.029)
Brazil chilled	0.171**			-0.088**	0.068*	0.025	-0.013	-0.014	0.040
	(0.031)			(0.032)	(0.027)	(0.028)	(0.018)	(0.025)	(0.029)
U.S. chilled	0.018				-0.096*	-0.057	0.023	-0.031	0.021
	(0.038)				(0.043)	(0.030)	(0.020)	(0.029)	(0.033)
Uruguay chilled	0.106**					-0.096	0.031	-0.084**	0.000
	(0.029)					(0.051)	(0.018)	(0.030)	(0.031)
ROW chilled	0.083**						-0.102**	0.052**	-0.038
	(0.032)						(0.021)	(0.020)	(0.024)
Brazil frozen	0.156**							-0.095*	0.109**
	(0.039)							(0.037)	(0.031)
ROW frozen	0.177**								-0.171**
	(0.055)								(0.052)

Demand Estimates

Marginal import share estimates (θ_i)

- Imports of Argentina chilled most responsive to expenditure changes (0.21)

- An additional dollar expenditure towards beef imports may cause an average $0.18 increase in ROW frozen, and increases of $0.17 and $0.16 for Brazilian chilled and frozen

- Only $0.18 remains, on average, for expenditures on chilled beef from U.S., Uruguay and Argentina

Conditional cross-price estimates

- Conditional substitutes: U.S. chilled and Brazilian chilled; Uruguay and Argentina chilled; ROW frozen and Brazil frozen, ROW chilled and Brazil frozen

- Conditional complements: Brazil frozen and Uruguay chilled; Australian and Brazilian chilled

- Most significant price competition: Uruguay and Argentina chilled (0.15); Brazil and ROW frozen (0.11)

- Only significant cross-product competition: Australia chilled and ROW frozen (0.07)

Expenditure and Own-price Elasticities

	Expenditure (η_i)	Own-price (η_{ij})
Argentina chilled	0.815 (0.262)**	-1.224 (0.327)**
Australia chilled	1.067 (0.443)*	-2.239 (0.463)**
Brazil chilled	1.497 (0.275)**	-0.772 (0.279)**
U.S. chilled	0.185 (0.394)	-0.981 (0.441)*
Uruguay chilled	1.070 (0.292)**	-0.967 (0.516)
ROW chilled	1.168 (0.448)**	-1.443 (0.292)**
Brazil frozen	1.268 (0.318)**	-0.777 (0.305)*
ROW frozen	1.080 (0.336)**	-1.046 (0.316)**

Expenditure and Own-Price Elasticities

Conditional expenditure elasticities

- Largest estimates: Brazilian chilled (1.5) and frozen (1.3); Additional estimates range from to 1.07 for both Australia and Uruguay chilled to 1.17 for ROW chilled

- Only product that is expenditure inelastic is Argentine chilled (0.82)

Conditional own-price elasticities

- EU beef import demand is elastic for half the products considered including Argentine chilled (1.22), Australian chilled (2.24), ROW chilled (1.44) and ROW frozen (1.05).

- Own-price elasticity of U.S. chilled is nearly 1.0, and is 0.77 for both Brazilian chilled and frozen.

- Brazilian beef imports (both fresh and frozen) are the least responsive to price, while Australian chilled is the most sensitive to price changes.

- The own-price responsiveness of Uruguayan chilled is insignificant.

Impacts of Removing the Beef Hormone Ban

Country and Product	Baseline		NTM Removal		Difference		
	Value ($ mill.)	Share (%)	Value ($ mill.)	Share (%)	Value ($ mill.)	Value (%)	Share (%)
Argentina chilled	$478.19	23.61	$470.02	23.16	-$8.16	-1.71	-0.45
Australia chilled	183.95	9.08	161.94	7.98	-22.00	-11.96	-1.10
Brazil chilled	246.55	12.17	219.33	10.81	-27.22	-11.04	-1.36
U.S. chilled	216.30	10.68	256.00	12.61	39.70	18.35	1.94
Uruguay chilled	220.52	10.89	244.14	12.03	23.62	10.71	1.14
ROW chilled	130.62	6.45	122.74	6.05	-7.88	-6.03	-0.40
Brazil frozen	266.85	13.17	279.43	13.77	12.58	4.71	0.60
ROW frozen	282.73	13.96	275.80	13.59	-6.92	-2.45	-0.37

Impacts of NTM Removal and 50% TRQ Expansion

Country and Product	Baseline		NTM Removal		Difference		
	Value ($ mill.)	Share (%)	Value ($ mill.)	Share (%)	Value ($ mill.)	Value (%)	Share (%)
Argentina chilled	$478.19	23.61	$664.86	21.85	$186.67	39.04	-1.76
Australia chilled	183.95	9.08	260.07	8.55	76.12	41.38	-0.53
Brazil chilled	246.55	12.17	403.92	13.27	157.37	63.83	1.10
U.S. chilled	216.30	10.68	276.03	9.07	59.73	27.61	-1.61
Uruguay chilled	220.52	10.89	362.08	11.90	141.55	64.19	1.01
ROW chilled	130.62	6.45	199.01	6.54	68.40	52.37	0.09
Brazil frozen	266.85	13.17	448.60	14.74	181.74	68.11	1.57
ROW frozen	282.73	13.96	428.49	14.08	145.76	51.56	0.12

TPP Import Projections

- As expected, one key result of the NTM removal is an increase of U.S. beef exports to the EU. Imports of U.S. beef are estimated to increase by nearly $40 million, which is equal to an 18.35% increase in import value and nearly a 2% gain in import share.

- Imports for Uruguayan chilled and Brazilian frozen beef increase by 10.71% and 4.71%, respectively

- Uruguayan chilled gains 1.14% market share while Brazilian frozen market share gains equal 0.6%

- All other products in the sample exhibit decreases in exports to the EU with corresponding losses in market share

- As chilled exports from the U.S. become more competitive under the NTM removal, EU importers substitute away from chilled products from other sources (except Uruguay) to import more U.S. chilled beef

- The largest export losses are experienced by Australian and Brazilian chilled with market share losses of 1.1% and 1.36%

- Argentine chilled beef, the leading EU beef import product and source, experiences the smallest export losses (-1.71%) with a 0.45% market share decrease

- Despite decreases in imports for 5 of the 8 products/sources considered under the NTM removal scenario, total EU imports of beef increase by 0.59%, leaving only a relatively minor change in total EU beef imports if the beef hormone ban is removed.

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TPP Import Projections

- While lifting the beef hormone ban is expected to cause negligible changes in total EU imports, the combined effect of the NTM removal in tandem with an expansion of the binding TRQ by 50% may cause an increase in EU beef imports, equal to an expansion in total import value of 50.22%.

- Import increase of more than $1 billion relative to the baseline scenario

- As EU beef imports expand, the competitiveness of beef exporters is similar to the baseline scenario
  - Except that Argentina remains the dominant exporter but market share decreases by 1.76%
  - Next highest beef import, Brazil frozen, increases market share by 1.57%

- Under the combined scenario, 5 of the 8 country/products increase market share while chilled beef from Australia and U.S. decrease market share by 0.53% and 1.61%

- Imports of U.S. beef are higher under the combined scenario; however, U.S. presence in the beef import market will be greatest if the NTM is removed and TRQ unchanged

- As expected, the potential for increased exports from all sources is greatest under the combined scenario where the NTM is removed and the TRQ is expanded.

Conclusion (1)

- E.U. regulations on biotechnological production practices that bans hormone use in beef production restricts imports of U.S. beef

- EU beef imports from all sources have been limited, given the presence of a binding TRQ

- We estimate EU beef import demand and assess how EU import preferences vary across import sources under the presence of a binding TRQ and a ban on hormone beef imports

- We then assess how a potential TTIP agreement that lifts the hormone ban on beef production and expands the existing TRQ may affect beef imports into the EU

Conclusion (2)

- Argentina's lead position in the EU is expected to persist under both scenarios
- U.S. may surpass the value of chilled beef imports from Brazil and Uruguay if the NTM is lifted
- NTM removal leaves total EU beef imports unchanged given source substitution
- Combined effects of NTM removal and TRQ expansion may substantially increase total EU beef imports from all sources with similar levels of competition between import sources relative to the baseline

Caveats: Additional factors not considered in this analysis

- In general, consumer acceptance of conventional U.S. food is low in the EU (Costa Font et al. 2008)
- Coexistence of hormone and non-hormone beef may lead to measures to require differentiation of products in the EU based on production practices (Gabriel and Menrad 2014)
- Additional cost and pricing implications is likely to occur if non-hormone beef products are to be differentiated from conventional beef products in the EU
- Future work should account for additional factors that may arise given the coexistence of hormone and non-hormone beef in the EU