

What Does Dairy Trade Modeling Tell Us? (About Important Dairy Globalization Issues)

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*Annual Workshop for Dairy Economists
and Policy Analysts*

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San Diego, CA (my hometown, BTW!)



Outline of the Presentation

- What are key issues and events in dairy globalization?
- How can modeling provide insights?
- What are the challenges (to dynamic modeling of dairy globalization)?

Dairy
Globalization

Modeling
Insights

Modeling
Challenges

Defining Dairy Globalization

Flows of:

- Dairy products (farm milk)
- Funds
 - Direct investments in production, processing, logistics, promotion
- Information
 - Technology, market intelligence, experience



Relationship development

- Partnerships, supply chain coordination



Scope of Dairy Globalization

Drivers:

- Demand growth
 - Income growth, urbanization, food service, policy
- Supply side
 - Milk production growth, export market experience, promotion investments, logistics/infrastructure development



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Effects:

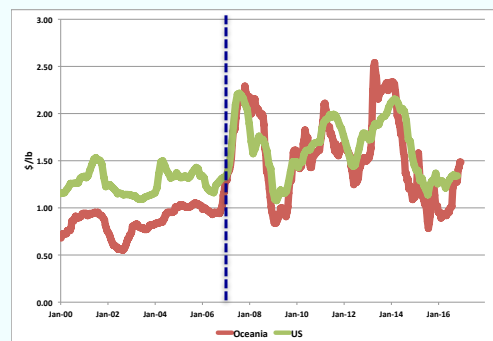
- Price convergence
 - Global price discovery
 - Product, farm milk?
- Environmental
 - Land use, GHG emissions, human health
- Other Economic
 - Employment, welfare



Dairy Globalization, 2006-2016

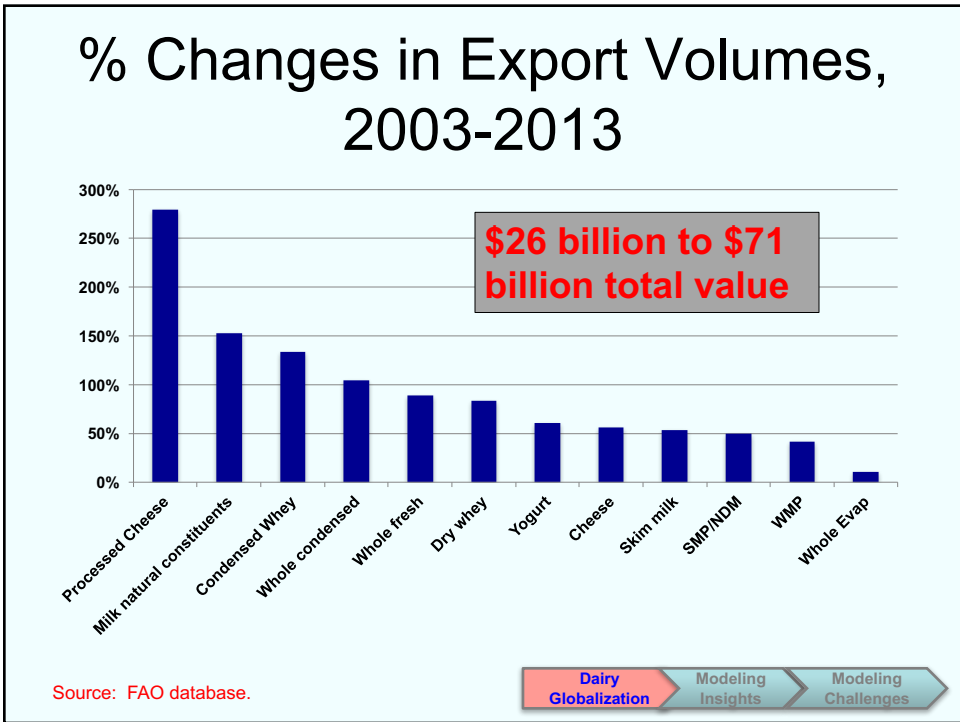
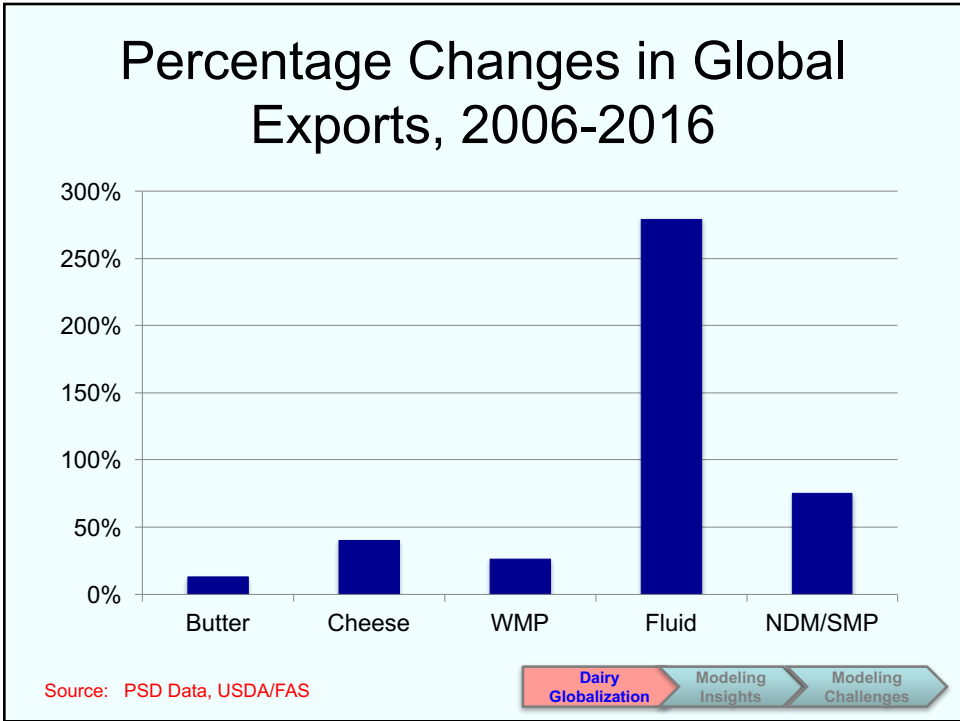
What Hath 10 Years Wrought?

- Price convergence in global dairy markets
 - Increased volatility
 - Cyclical behavior
- Emergence of China as key importer
- Emergence of US as key, consistent exporter
- Phase out of EU production quotas

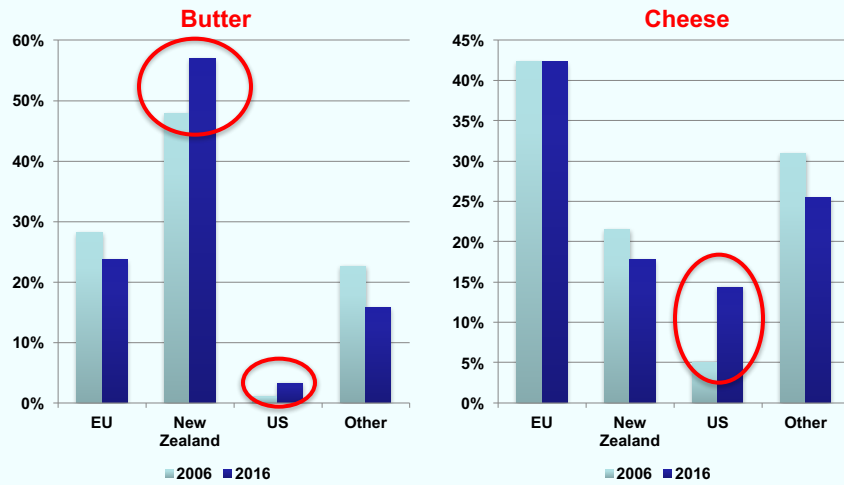


Price convergence in WMP markets, after 2006





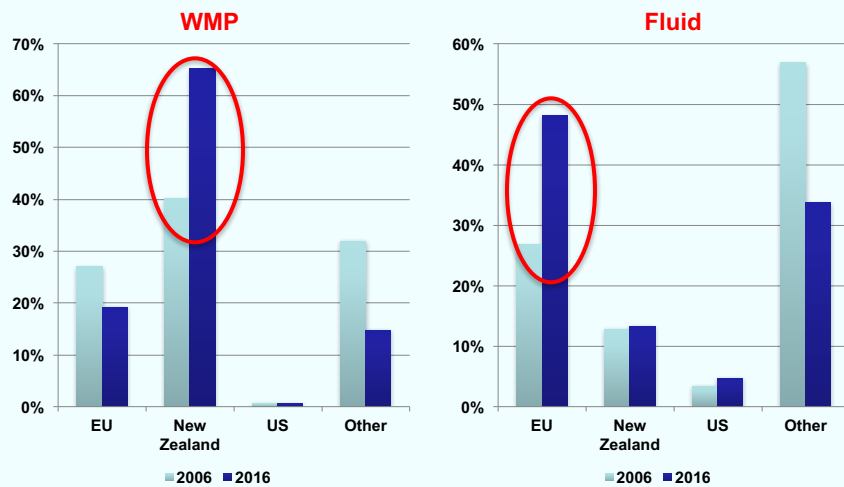
Export Market Shares, 2006 and 2016



Source: PSD Data, USDA/FAS



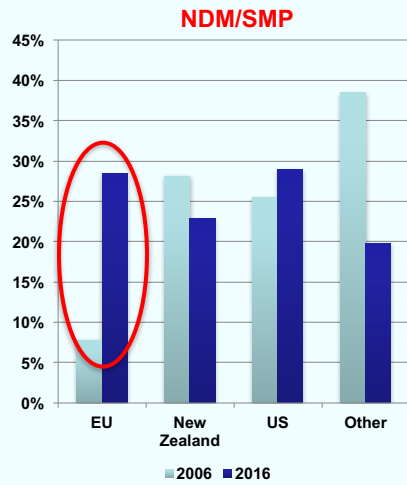
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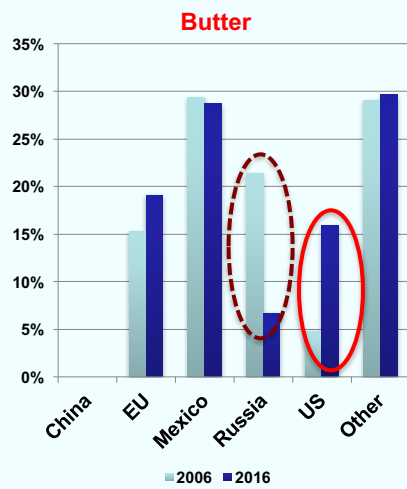
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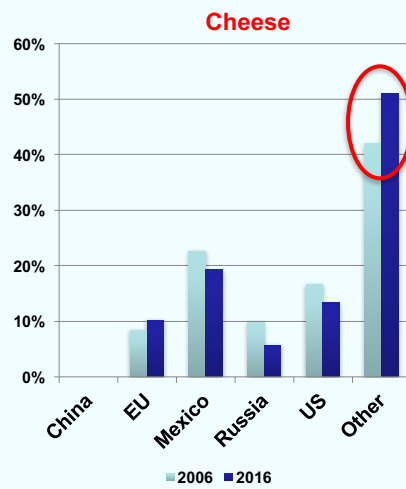
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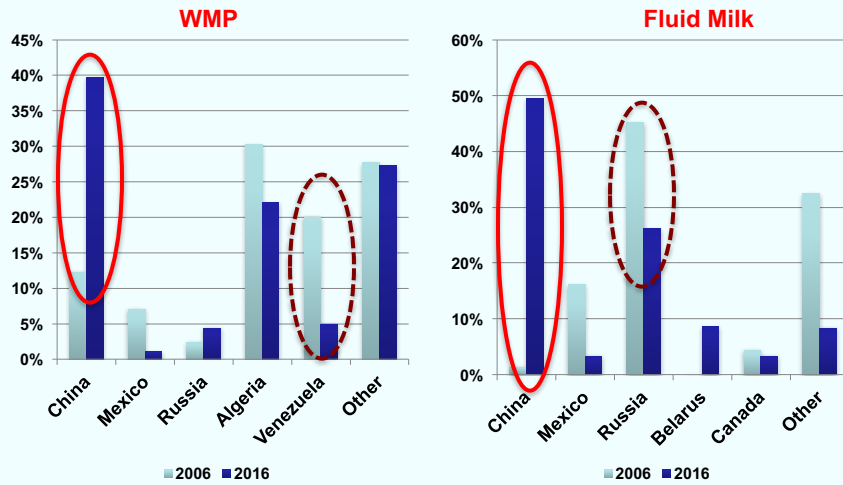
Import Market Shares, 2006 and 2016



Source: PSD Data, USDA/FAS



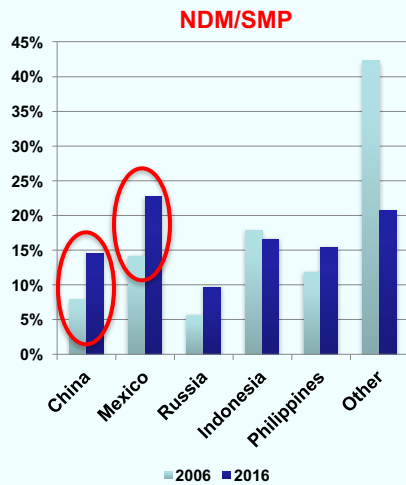
Import Market Shares, 2006 and 2016



Source: PSD Data, USDA/FAS



Import Market Shares, 2006 and 2016

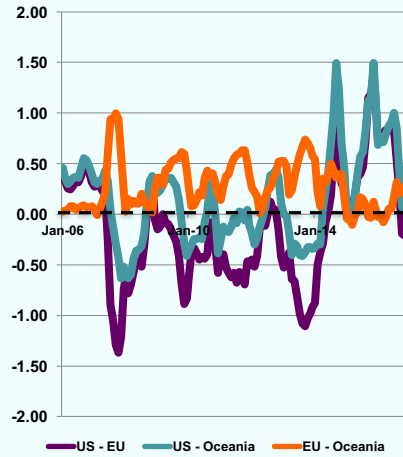


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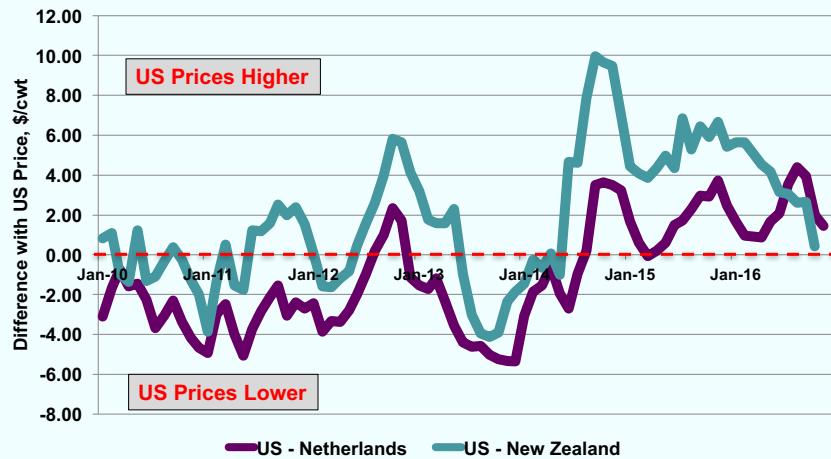


Butter Markets Show Less Integration

- Butter price spreads larger than for other products
 - Recent changes in the relationship
- Butter more protected by trade policy than other products
- Cause of recent farm milk price divergence?



Farm Milk Price Divergence Re-Emerges, 2014 to ?



Potential Trade Agreements

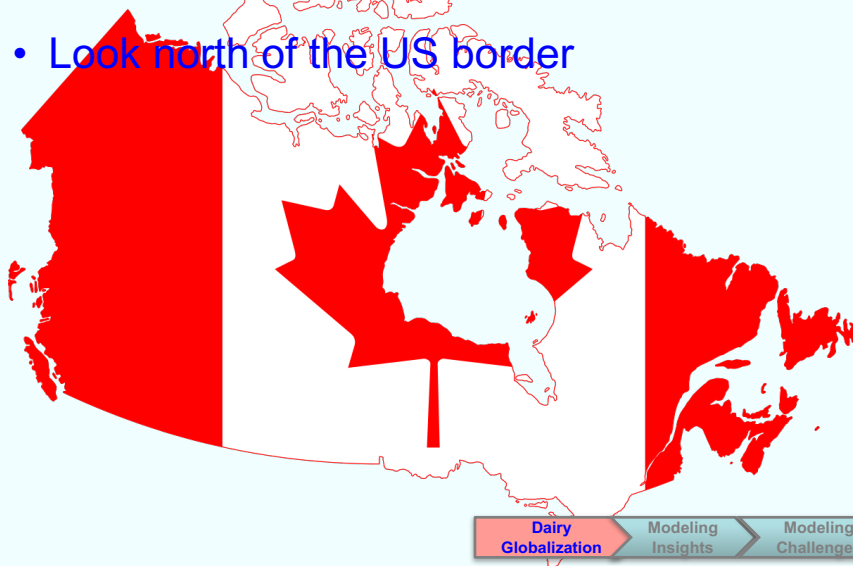
- Previously, TPP
- Tenuously, TTIP
- Many bilateral agreements?
- NAFTA, revisited?

What are the implications for US dairy market outcomes?



Potential Trade Disputes

- Look north of the US border



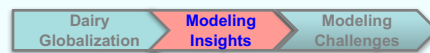
Dairy Globalization is Multi-faceted

- Many structural changes
 - EU production quota phase out
- Many short-term events
 - China in and out of butter markets, 2014
 - (Ongoing) Russian trade embargo
- Many proposed modifications to trading relationships
- Many (potential) trade and globalization conflicts



What Can Models Tell Us?

- Explain past developments
- Predict ranges of future outcomes



Current Modeling Approaches*

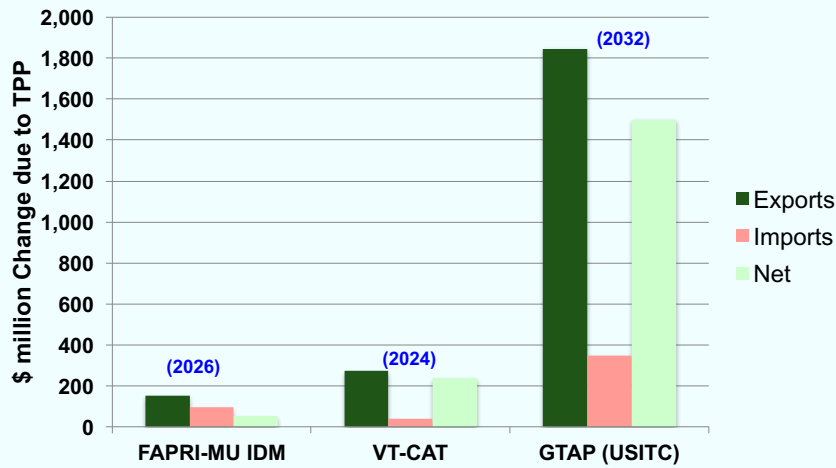
* Academic models. Other commercial and proprietary models exist.

- GTAP
 - General equilibrium model
 - Limited commodity coverage
- FAPRI-MU International Dairy Model
 - Partial equilibrium dynamic model
- Virginia Tech – Center for Agricultural Trade
 - Mixed complementarity formulation
 - Partial equilibrium

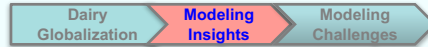


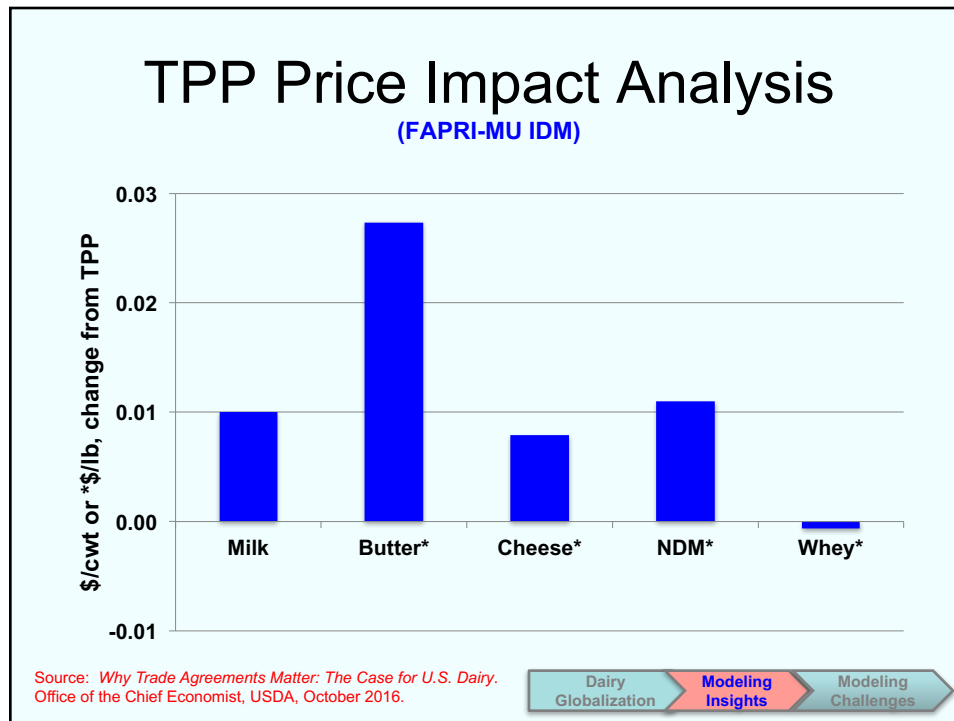
US TPP Impact Analysis

(Through indicated year)



Source: *Why Trade Agreements Matter: The Case for U.S. Dairy*. Office of the Chief Economist, USDA, October 2016.



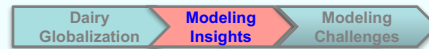


What Can Models Tell Us?

- Explain past developments
- Predict ranges of future outcomes
- Organize existing knowledge base
 - Data and behavioral assumptions
- Assess the importance of information
 - Not all information has equal value
- Allow hypothesis testing
 - Are our assumptions about the world really correct?

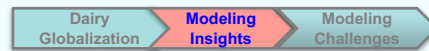
The Need for a Dynamic Model

- Many phenomena related to globalization are dynamic—they play out over time
- Feedback effects are not well captured in existing partial equilibrium models
 - Even the dynamic ones
 - Or (dynamic) CGE models
- **Dynamic complexity: short and long-run effects can differ**



The Need for Detailed Product and Component Coverage

- Trade depends on product specifications
- Trade policies also very product-specific
- Products are linked as joint products, as intermediate products and as substitutes in production or in use

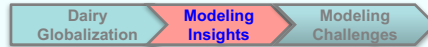


Dynamic Global Dairy Supply Chain Model (DGDSCM)

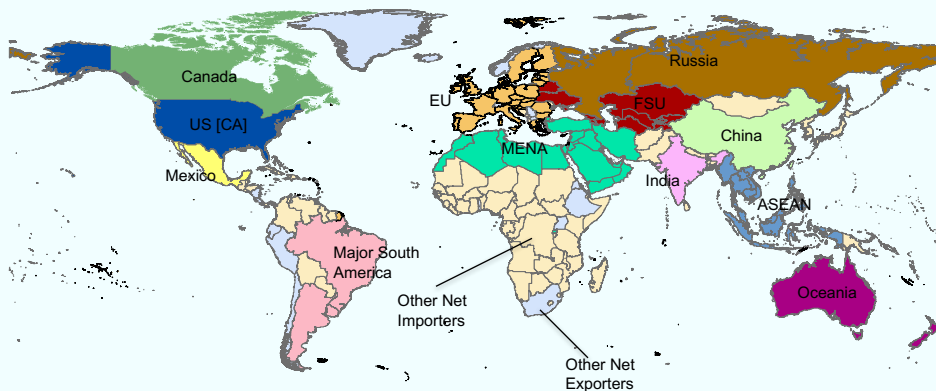
- Production, processing, demand and trade for 15 world regions
 - Complete global coverage
- Monthly evolution of prices and trade flows
- Assessment of past and future scenarios

Model Characteristics:

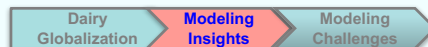
- 15 regions
- 23 final and intermediate products
- Component balance for milk and product yields
- Supply-chain-based business decisions
- “Dynamic disequilibrium”



Dynamic Global Dairy Supply Chain Model (DGDSCM)



Regional Designations



DGDSCM Products

Product Category	Final Product	Intermediate Product	Tradable Product
Fluid Milk	X		X
Yogurt	X		X
Frozen Desserts	X		X
Cottage Cheese	X		
American-type Cheeses	X		X
Other Cheeses	X		X
Fluid Whey		X	
Separated Whey		X	
Whey Cream		X	
Dry Whey	X	X	X
Whey Protein Concentrate 34% Protein	X	X	X
Whey Protein Concentrate 80% Protein	X	X	X
Lactose	X	X	X
Butter	X		X
Anhydrous Milk Fat (AMF)	X		X
Nonfat Dry Milk	X	X	X
Infant Formula	X		X
Condensed Skim Milk	X	X	
Other Evaporated, Condensed & Dry products	X		X
Casein	X	X	X
Caseinates	X	X	X
MPC, < 50% protein	X	X	X
MPC, ≥ 50% protein	X	X	X



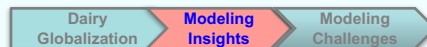
DGDSCM Dynamics

Farm Level:

- Profitability and expectations drive cow numbers and milk per cow
- Asymmetric response to profitability changes
 - Less responsive to downturns
- Milk price derived from product prices

Processing Sector:

- Production volumes driven by profitability and demand
 - NDM and butter are residual products
- Price-setting based on inventory coverage
 - Product stocks



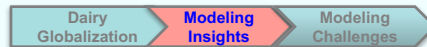
DGDSCM Dynamics

Product Demand:

- Base levels of final use “commercial disappearance”
- Final demand based on assumed annual growth rates and prices
- Intermediate product demand endogenously determined
 - Costs of selected feasible combinations

Trade Flows:

- Based on previously observed levels
- Changes driven by changes in relative landed prices
 - Including transportation costs and exchange rate factors
- Base levels updated over time by recent experience
 - “Anchoring and adjustment”

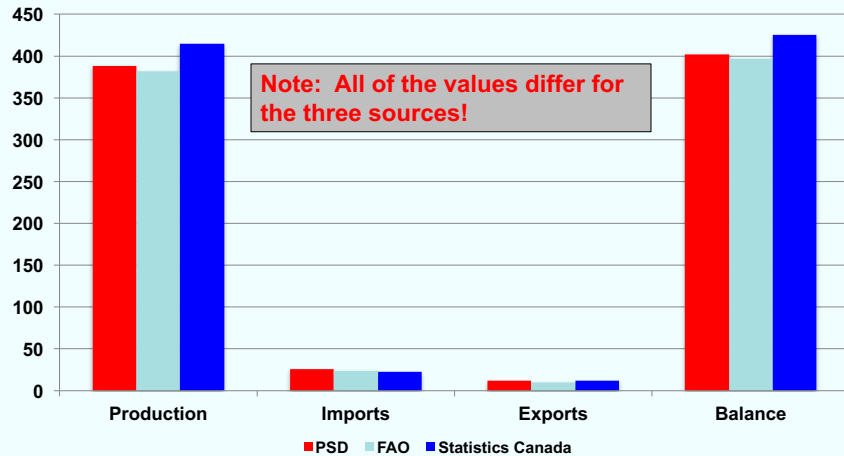


We Assess Globalization with Limited, Inconsistent Data

- Inventory data lacking for price discovery
- S&U data often lack consistency
 - Especially for component balance
- Import and Export totals differ
- Trade policy database not generally available



Example of Data Inconsistency: All Cheese, Canada, 2013



Major Effort for Data for Dynamic Model

- Multiple inconsistent sources
- Incomplete sources
- Aggregation
 - Trade policies differ within regions
- Model calibration and evaluation



Other (Omitted) Factors

Factors other than (landed) price determine dairy trade flows--now and later

- Working relationships, trust, reputation, joint ventures
- Product characteristics not captured in trade data
- Flows of information and funds (investment) will alter the dairy trade landscape



Coming This Summer to Prime Time

