

# **Invasive Species & International Livestock Trade**

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# Research Team

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# Overview


- **Motivation**
- **Objectives**
- **Modeling & Results**
- **Project Progress and Plan**



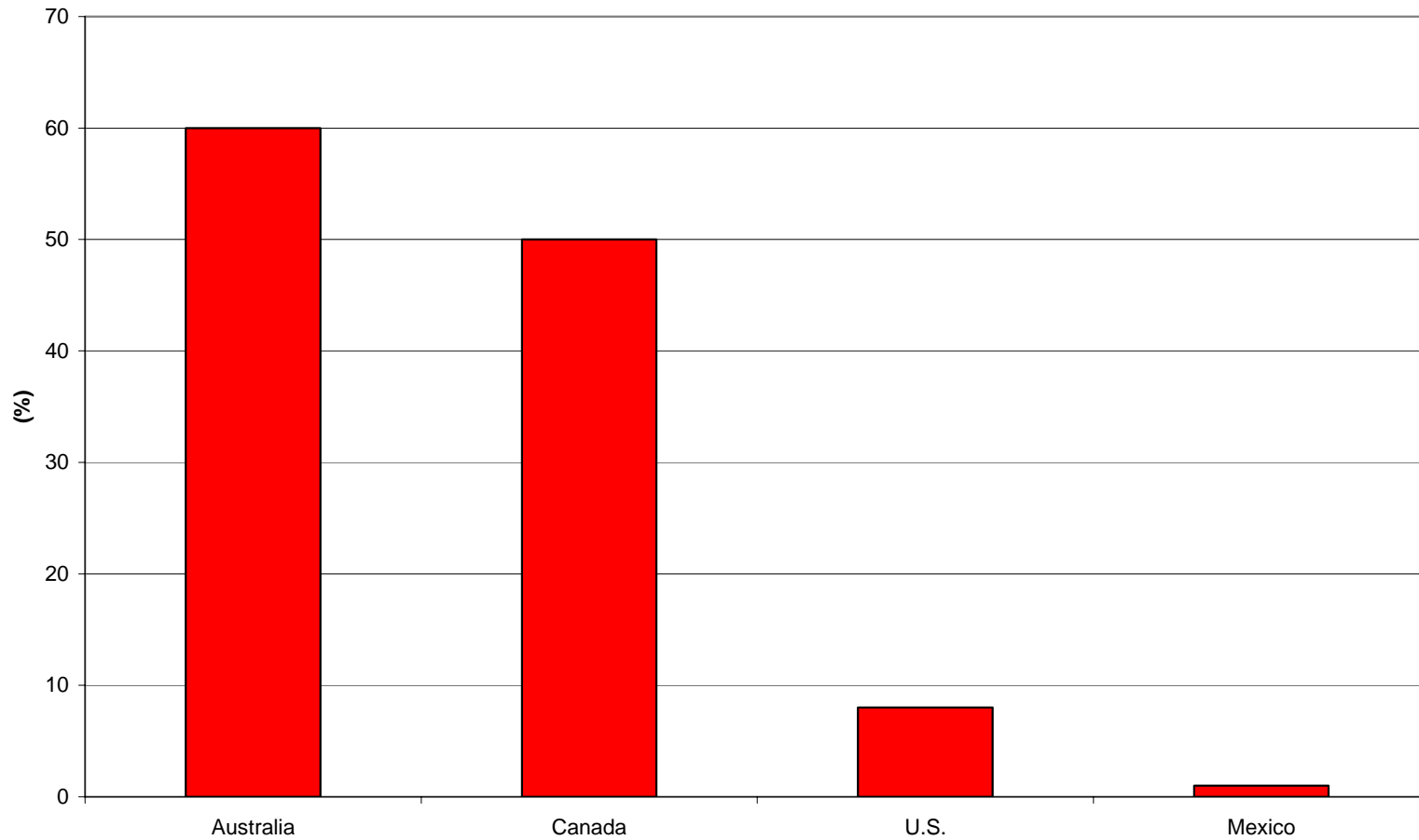
## Motivation

- **Invasive species in livestock pose a serious threat to agriculture, human health, and the economy.**
  - **The UK livestock industry has suffered enormous losses due to **FMD** outbreaks (most recent cases in 2007).**
  - **A single **mad cow** (BSE) found in Alberta in 2003 cost Canada \$25 million per day (FSB News, 2003).**
  - **In 2003, the U.S. lost about \$3-5 billion in exports because a single incident of **mad cow** disease in Washington State.**

## Motivation

- **Invasive species policies and impacts differ across the world given cultural, socio-economic, political and spatial diversity. For example,**
  - **U.S. has neighbors (Canada & Mexico), large domestic population, feedlot driven beef production, exports about 10% of production.** 
  - **Australia is a large island country, domestic population about the size of New York, 80% grass fed, large exporter of live and processed beef.** 

## Beef Exports Relative to Production



## Objectives

- ***Project:*** Provide estimates of welfare measures focusing on a invasive species outbreaks in livestock sectors for North America (U.S., Canada & Mexico) and Australia.
- ***Seminar:*** Examine hypothetical FMD outbreaks for beef cattle across countries
  - Focus on U.S. and Australia
  - Comments on Canada & Mexico

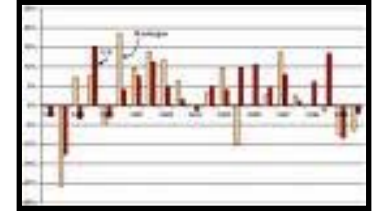




## Theoretical Model

- **Assume a representative producer maximizes an infinite stream of discounted expected profits subject to age specific stock dynamics and other production constraints.**
- **Representative producer chooses the number of cull cows, imports, exports to max expected profit.**
- **Using a partial equilibrium framework, and assuming perfectly competitive markets, products are sold on the domestic market, as well as imported and exported.**

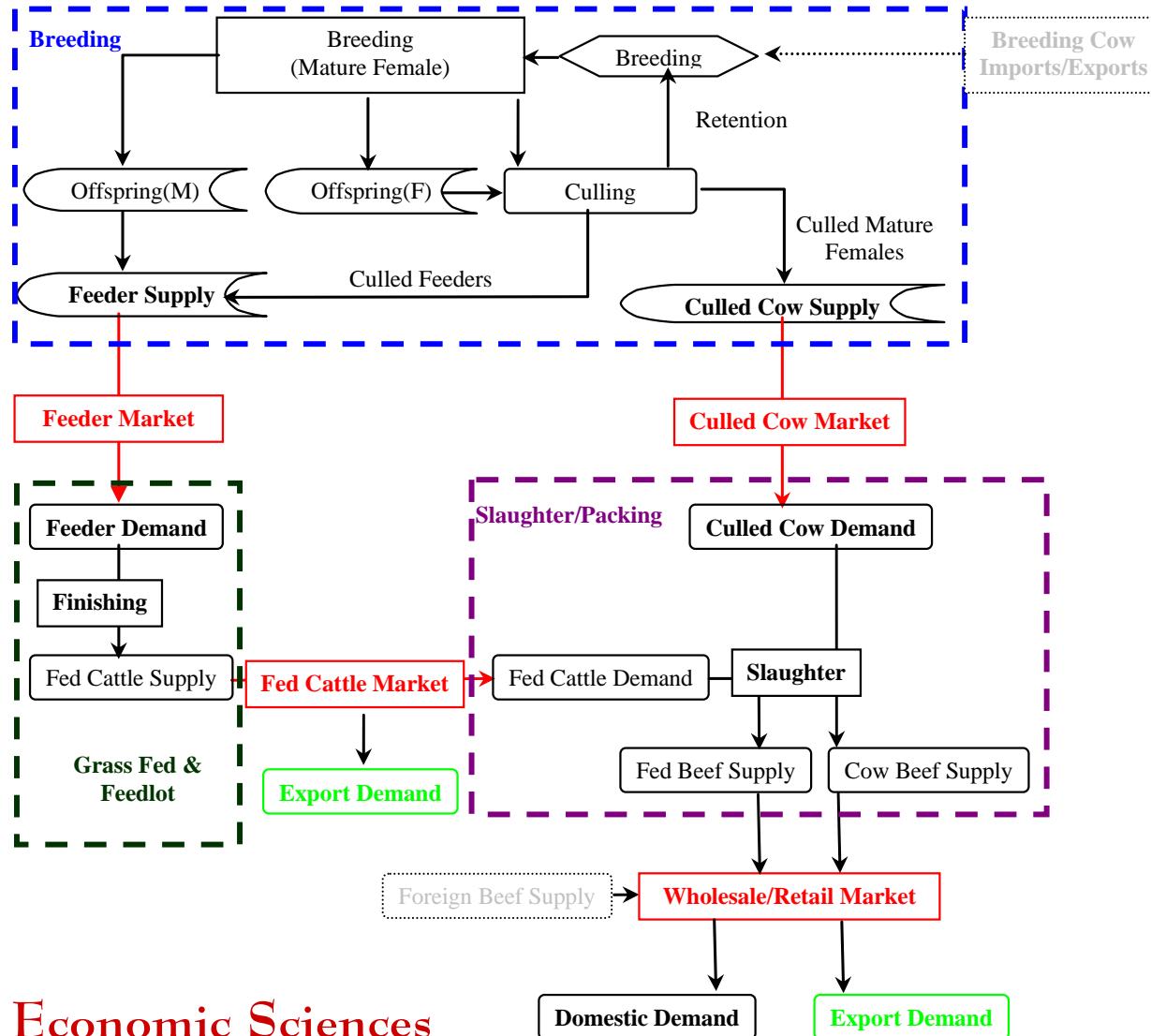




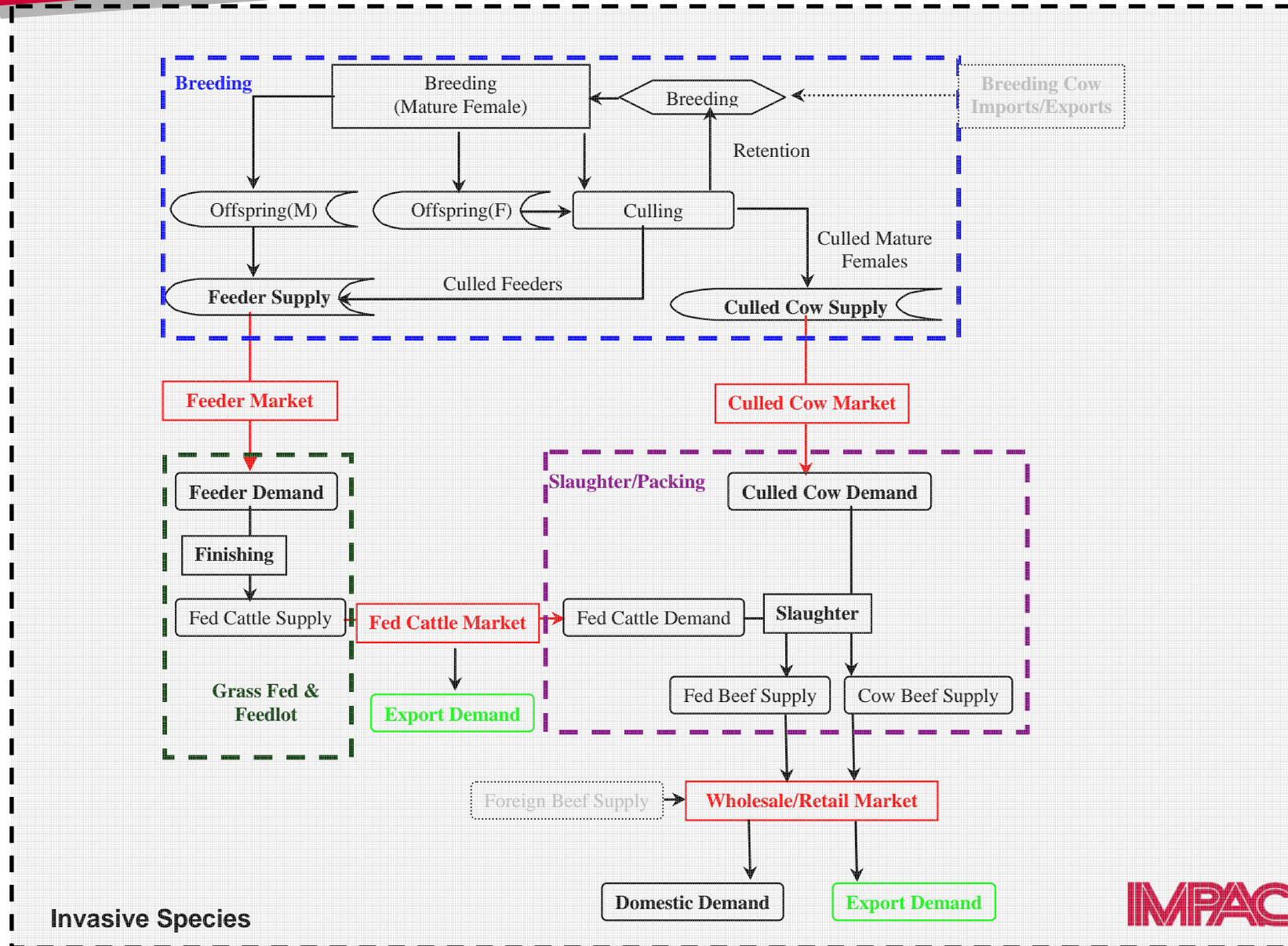
## Empirical Models

- **Specified as a discrete time optimal control model to account for intertemporal nature of livestock inventories and invasive species.**
- **Systematically link economic decisions on breeding inventories to feeder cattle, retail, and export markets.**
- **Markov chain process to predict FMD spread.**
- **Calculate welfare impacts from FMD outbreak.**

# Example Model: Australia



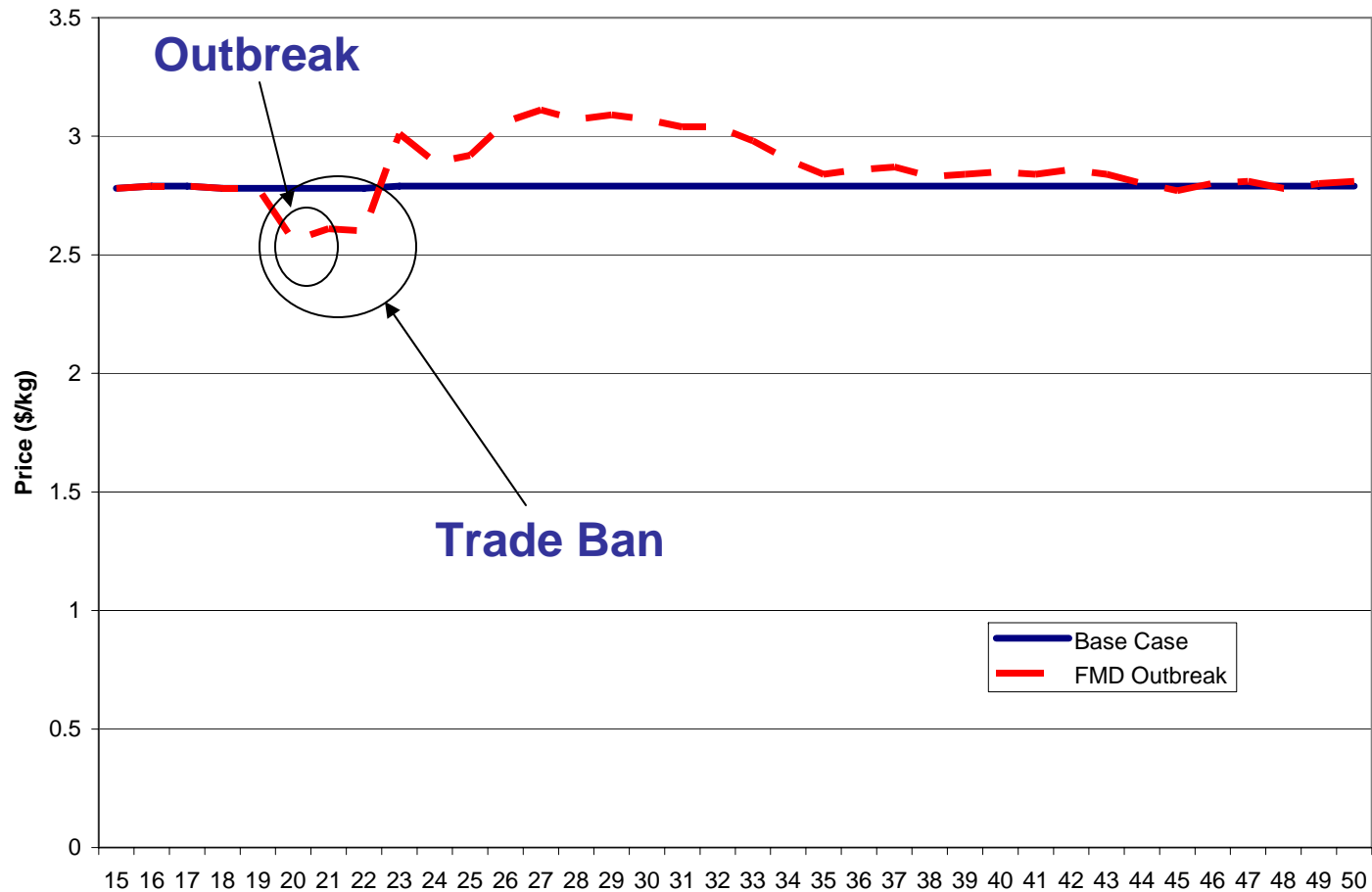
# Example Model: Australia



## Model Assumptions

- **Calibrated the U.S. & Australian models to 2000 inventories, market prices/quantities, etc.**
- **Production, feeding & slaughter parameters, and data from USDA & WADA.**
- **Consider a FMD outbreak with export market bans imposed for 3 yrs and decrease 5% domestic demand.**

## Beef Price Response to FMD Outbreak



## Selected Results

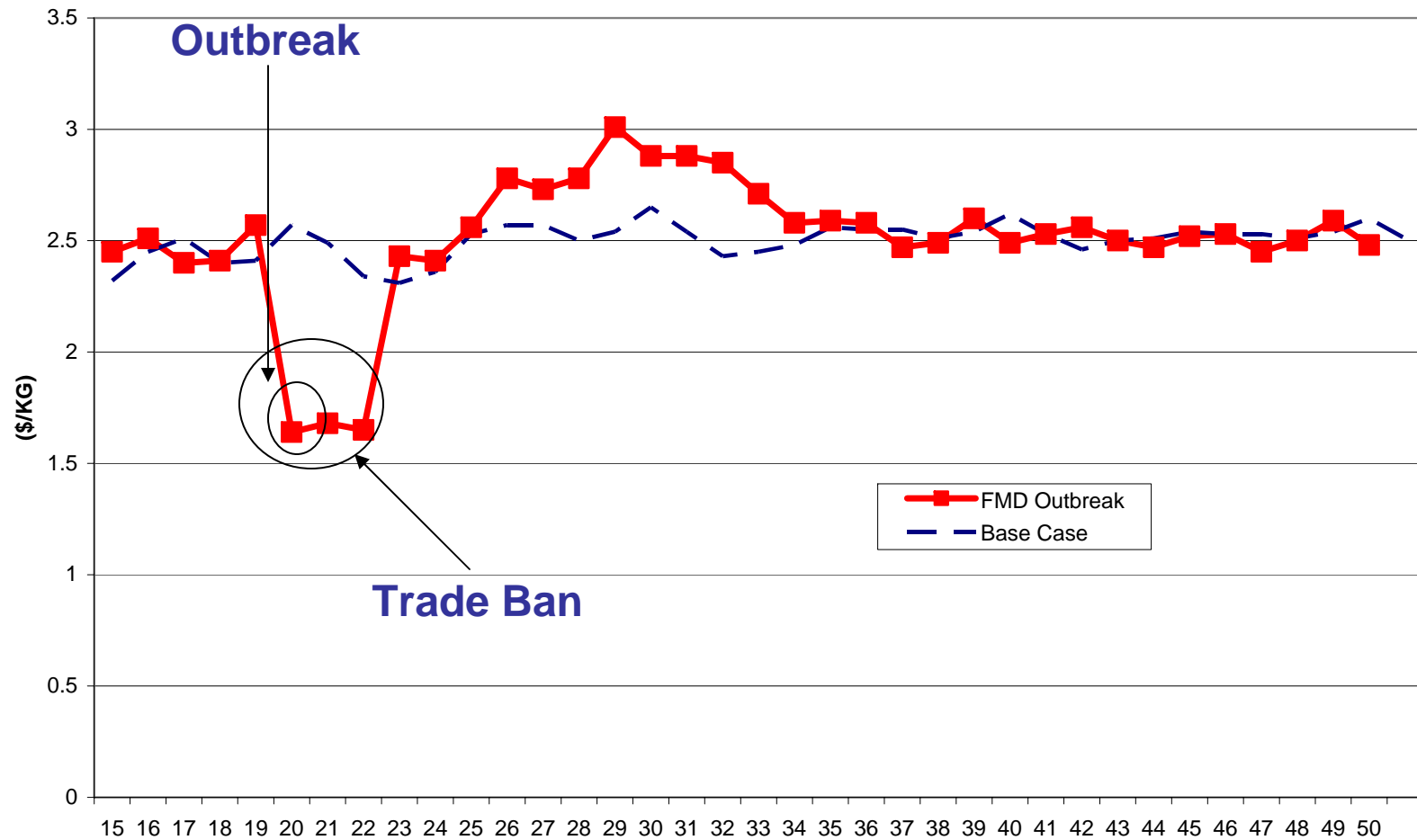
- **Price Impacts of FMD Outbreak:**
  - Price decrease of about **\$0.20/kg** during ban
  - Max price increase of about **\$0.30/kg** after ban
- **Welfare Changes**
  - Increase in beef sector profits of **\$US 6 billion**
  - Consumer surplus loss of **\$US 24 billion**

# Additional Assumptions

- **For Australia**
  - **80% fed cattle on pasture**
  - **20% in feedlot**
  - **Price grid constructed for WA**
  - **Live cattle exports**
  - **No cattle imports**



## Beef Price Response to FMD Outbreak





## Preliminary Results

- **Price Impacts of FMD Outbreak:**
  - Price decrease of about **\$AU 0.72/kg** during ban
  - Max price increase of about **\$AU0.50/kg** after ban
- **Welfare Changes**
  - Decrease in beef sector profits of **\$AU 3.0 billion**
  - Consumers benefit for 3 years during ban and but lose during the next 10 years.

## Discussion Points

- **Economic Impacts**
  - U.S.
  - Australia
  - Canada and Mexico
- **Alternative Policies**
  - Depopulation
  - Vaccination
  - Joint



## Project Progress and Plans

- **Currently have individual working models for the U.S., Canada, Mexico, and Australia.**
- **Consider regionalizing Australia into multiple sectors (e.g., eastern and western).**
- **Next step is to link U.S., Canada, Mexican, and Australian models in a spatial partial equilibrium framework (e.g., Rich 2007).**
- **Compare outcomes from *centralized* and *decentralized* planning problems for selected FMD scenarios.**

# Project Progress and Plans

- **Thank USDA-ERS PREISM program for supporting this research.**
- **Tozer, P.R. and T.L. Marsh, “Invasive Species Management: FMD in the Australian Beef Sector,” submitted to AARES Meetings 2008.**

# Questions/Comments?