

The Impact of BSE on U.S. Exports of Beef and Pork

By

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Introduction

- On December 23, 2003, the first Bovine Spongiform Encephalopathy (BSE) or “mad cow disease,” was confirmed in the United States. Many governments banned US beef imports.
- As a result, US total meat exports dropped from 4.5 billion Kg in 2003 to 3.8 billion Kg in 2004 (17 percent), and revenues dropped from US \$6.77 billion to US \$4.77 billion.
- The decline in exports of beef and products was large; beef meat declined from 833 to 143 million kg, and beef offal was down from 283 to 103 million Kg in just one year.
- However, US exports of pork meat and offal rose from 512 to 666 million Kg and from 134 to 199 million Kg, respectively.
- The recovery of US export-markets was slow. Beef and offal exports returned to its pre-BSE level for the first time in 2011.

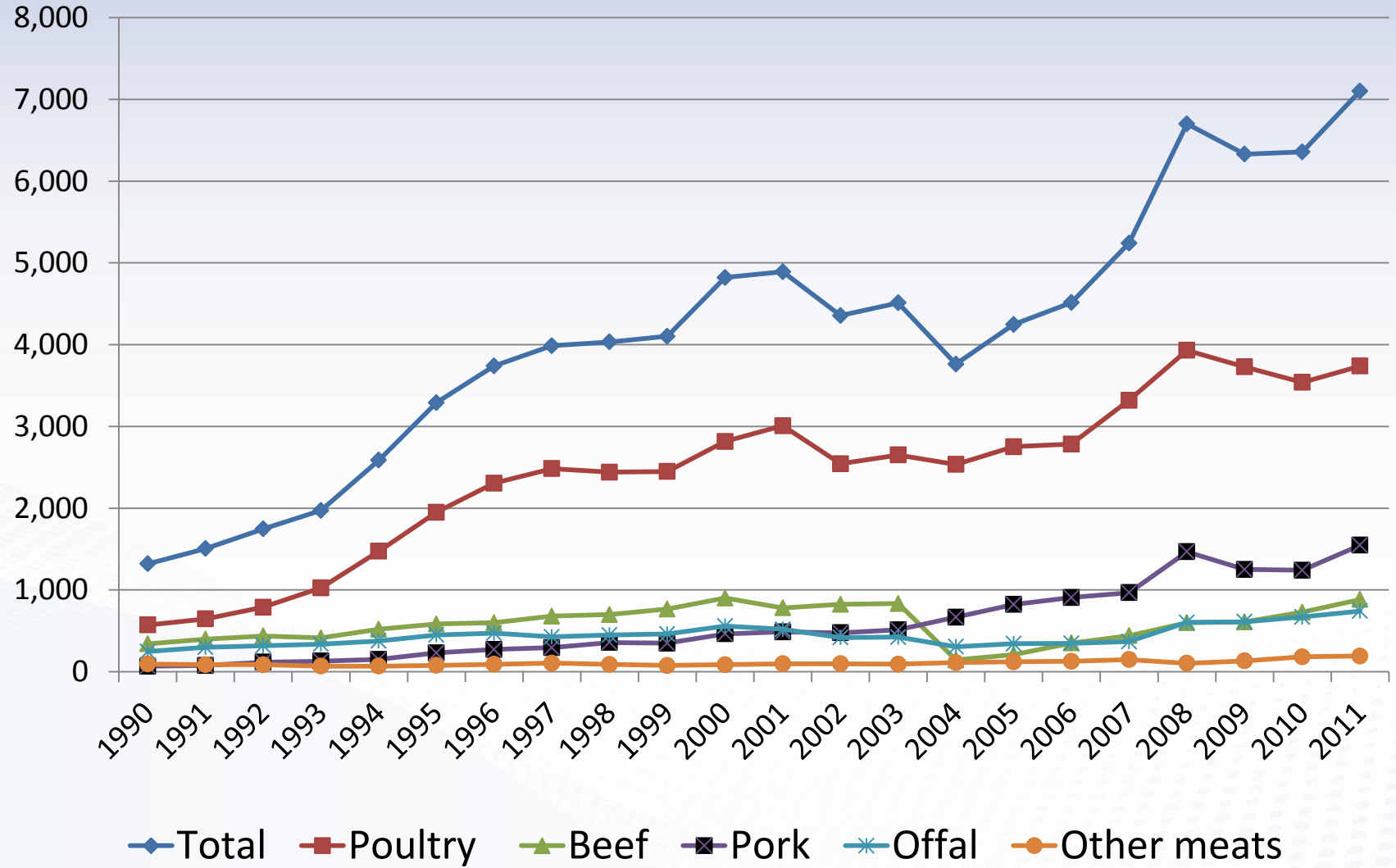
Major objective of the study

- 1- Evaluate the economic impact of the BSE event of December 23, 2003 on US exports of beef and pork meat products (meat and offal).
- 2- Test for structural changes in US exports of beef meat, pork meat, and their respective offal to the world.

Origin and spread of BSE disease

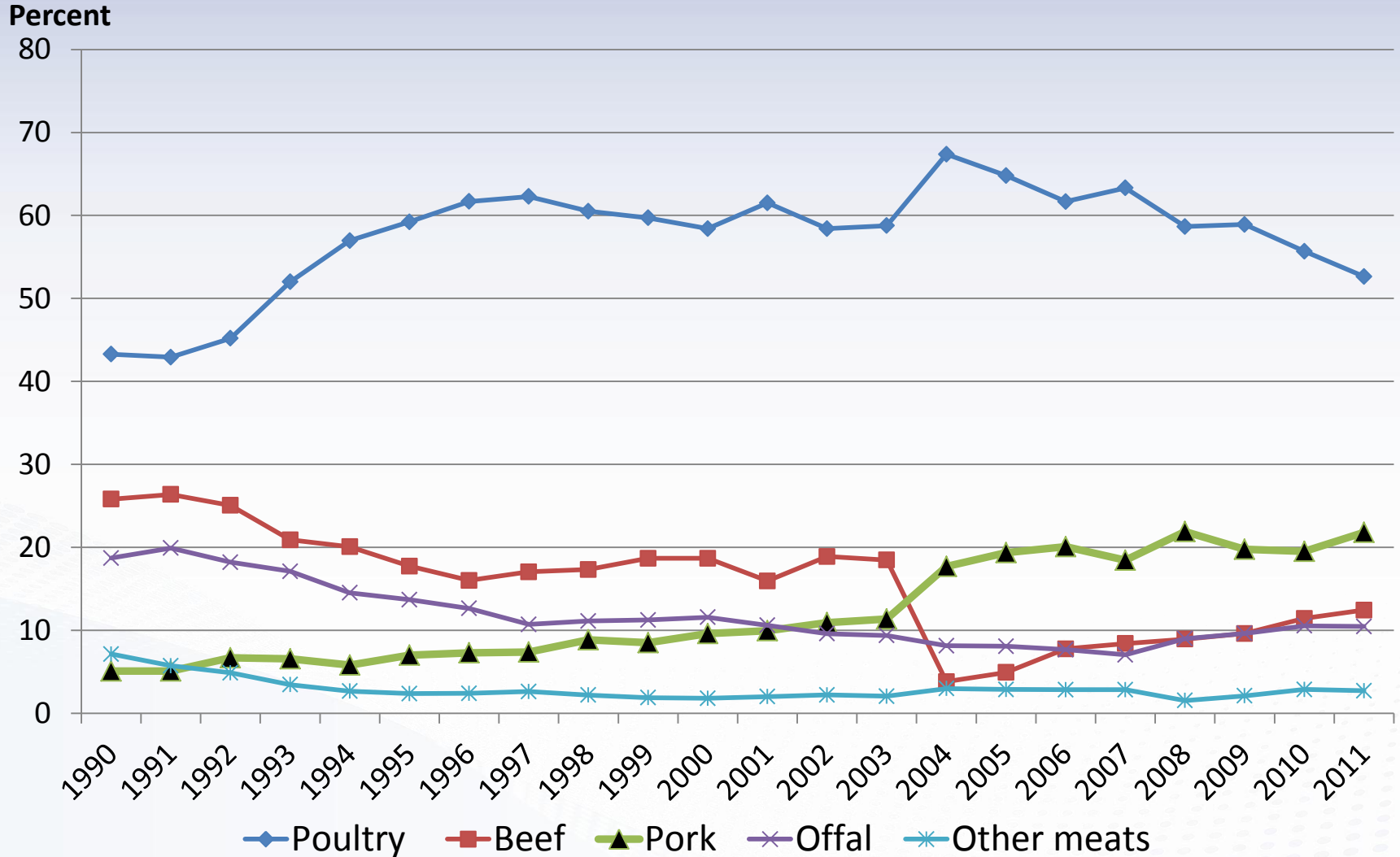
- The Bovine Spongiform Encephalopathy (BSE) or “Mad-cow disease” was first recognized in 1986 in the UK and spread to other countries (Mathews et al., 2004).
- However, consumers’ fear of eating beef accelerated sharply after the 1996 announcement of the possible fatal link between BSE and a new variant, Creutzfeldt-Jakob disease (vCJD), in humans.
- The BSE triggered a shift away from beef consumption toward pork, chicken, and lamb (Burton and Young, 1996; Henson and Mazzocchi, 2002; and Leeming and Turner, 2004).
- BSE had a substantial impact on beef consumption, production, prices, and trade as reported in the UK (Atkinson, 2003), in France (Latouche et al., 1998), in the Netherlands (Mangen and Burrell, 2001); in Belgium (Verbeke et al., 2000; Verbeke and Ward, 2001), in Japan (Peterson and Chen, 2005; Fox and Peterson, 2004), and in the United States (Schlenker and Villa-Boas, 2008).

Figure 1: US total meat exports by kind, 1990-2011



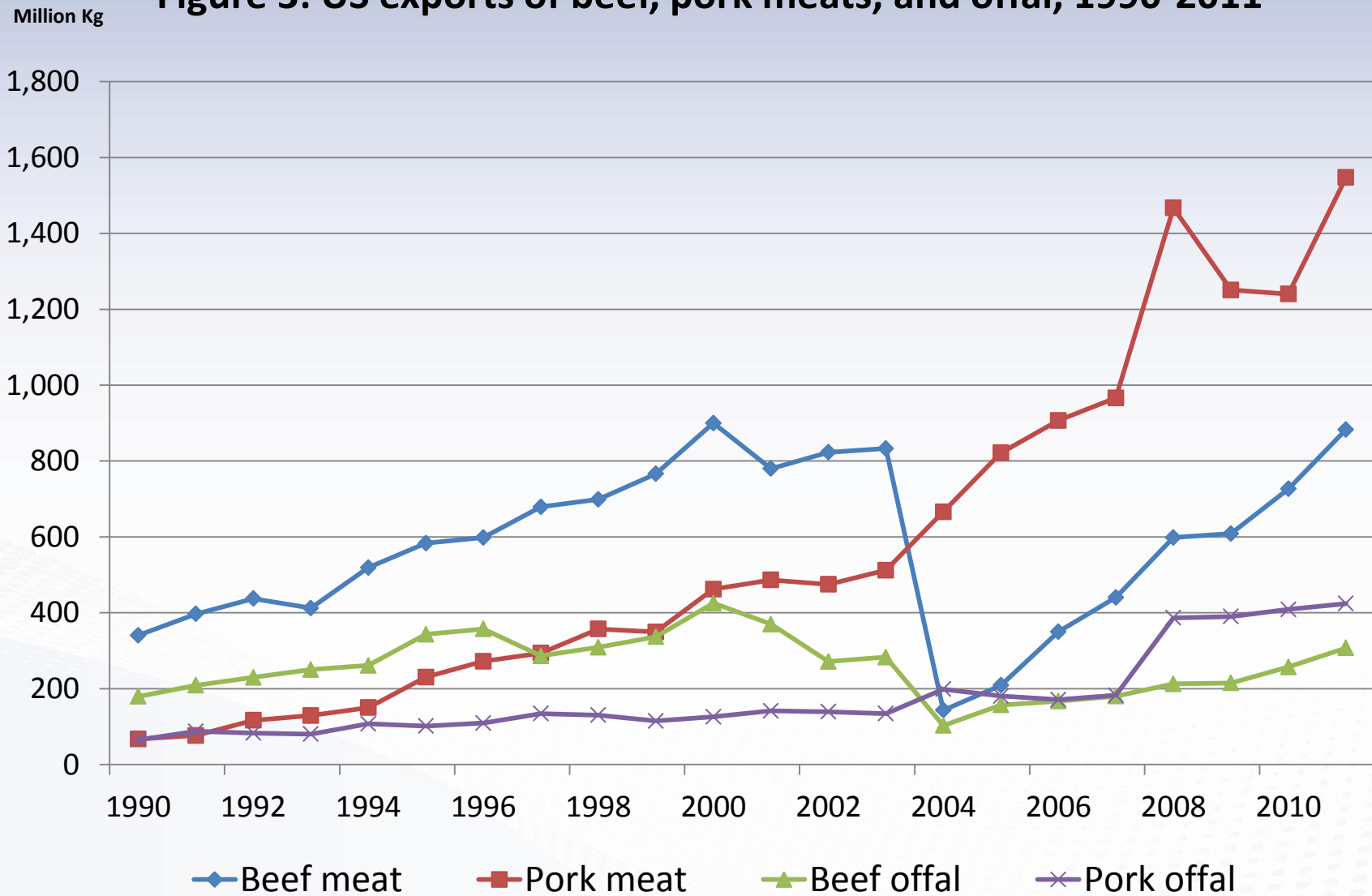
Source: World Trade Atlas, 2012

Figure 2: US export shares by meat kind, 1990-2011



Source: World Trade Atlas, 2012

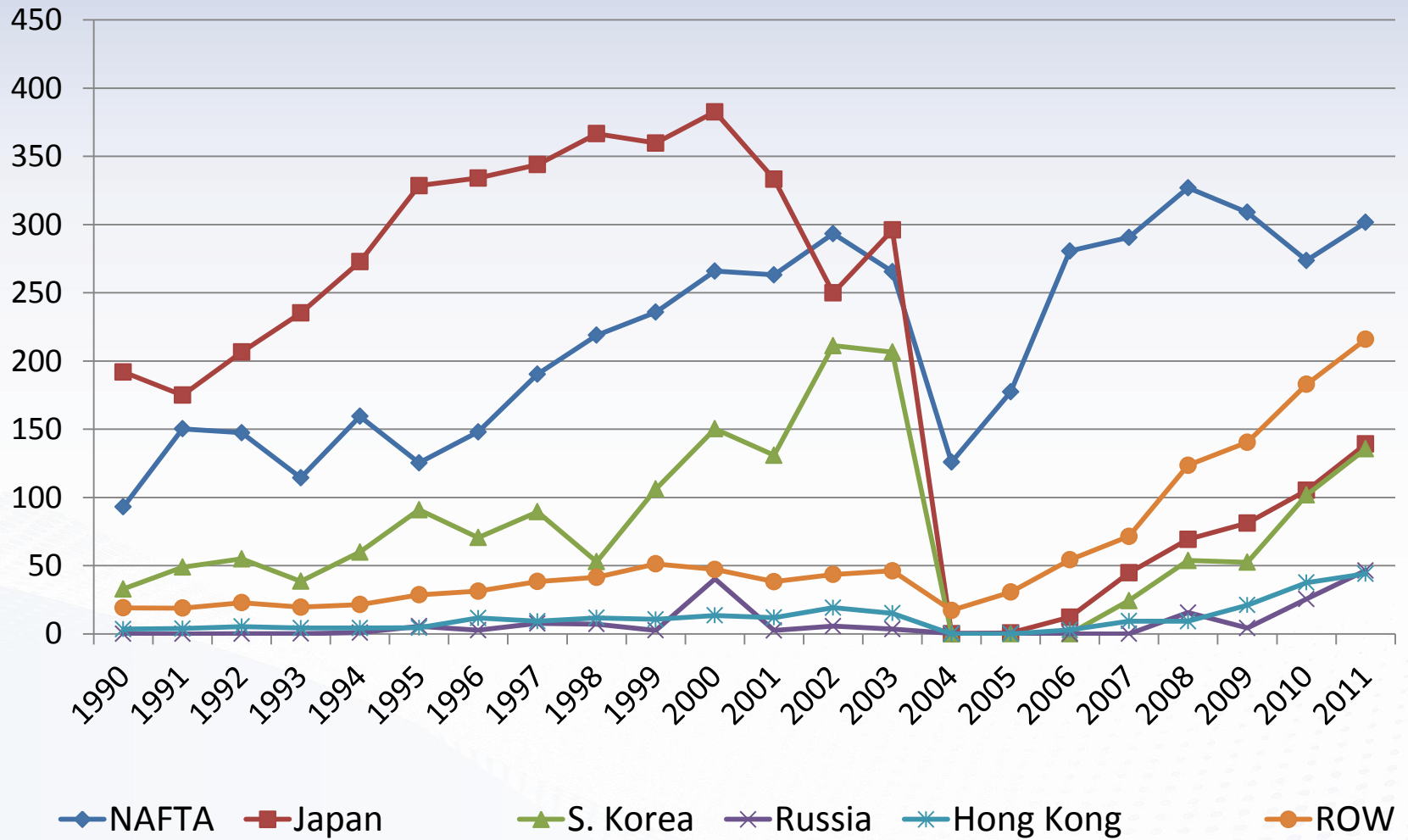
Figure 3: US exports of beef, pork meats, and offal, 1990-2011



Source: World Trade Atlas, 2012

Figure 4: US exports of beef meat by major markets, 1990-2011

Million Kg



Source: World Trade Atlas, 2012

Figure 5: US exports of pork meat to major markets, 1990-2011

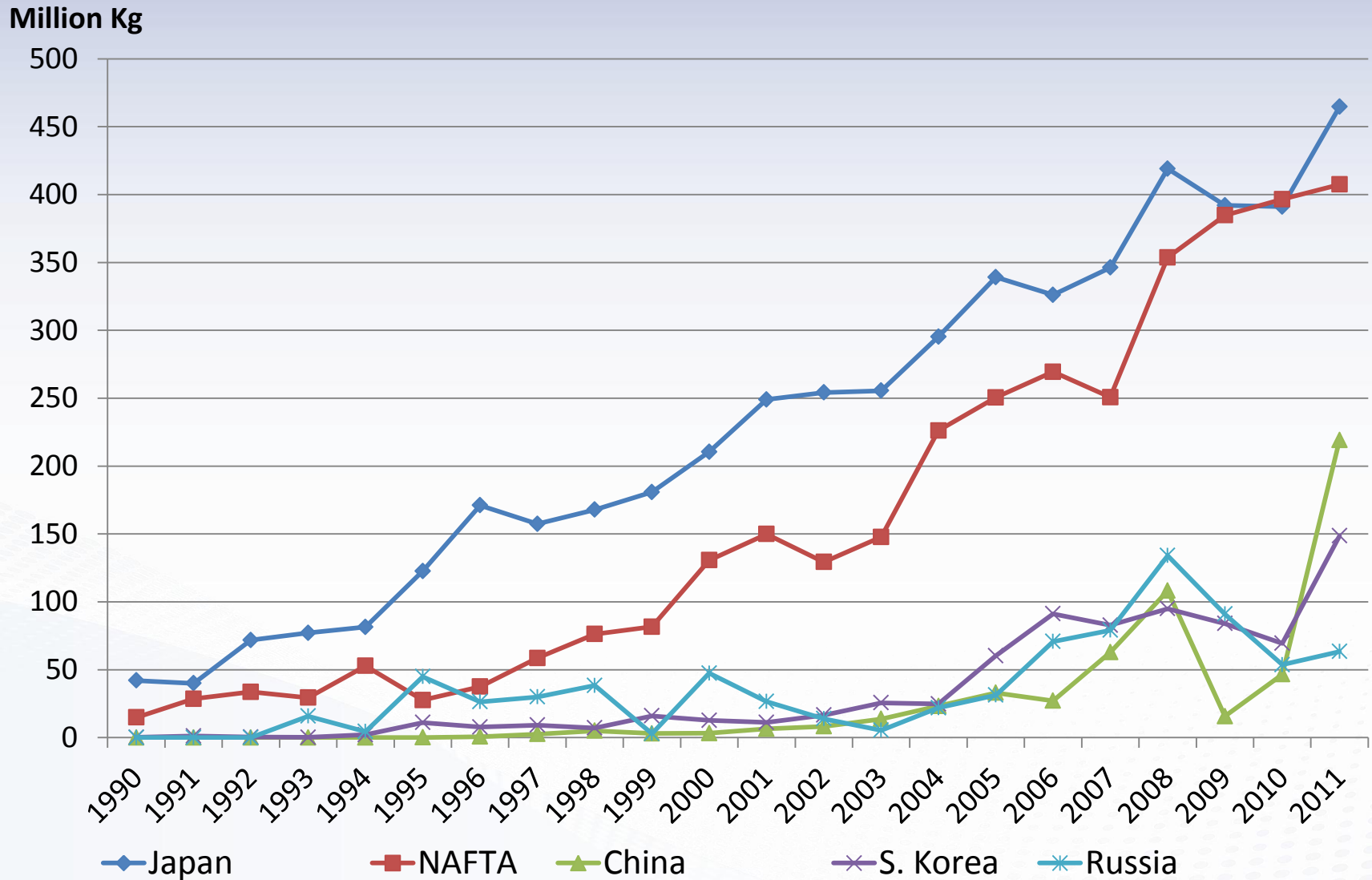


Figure 6: US beef offal exports to major markets, 1990-2011

Million Kg

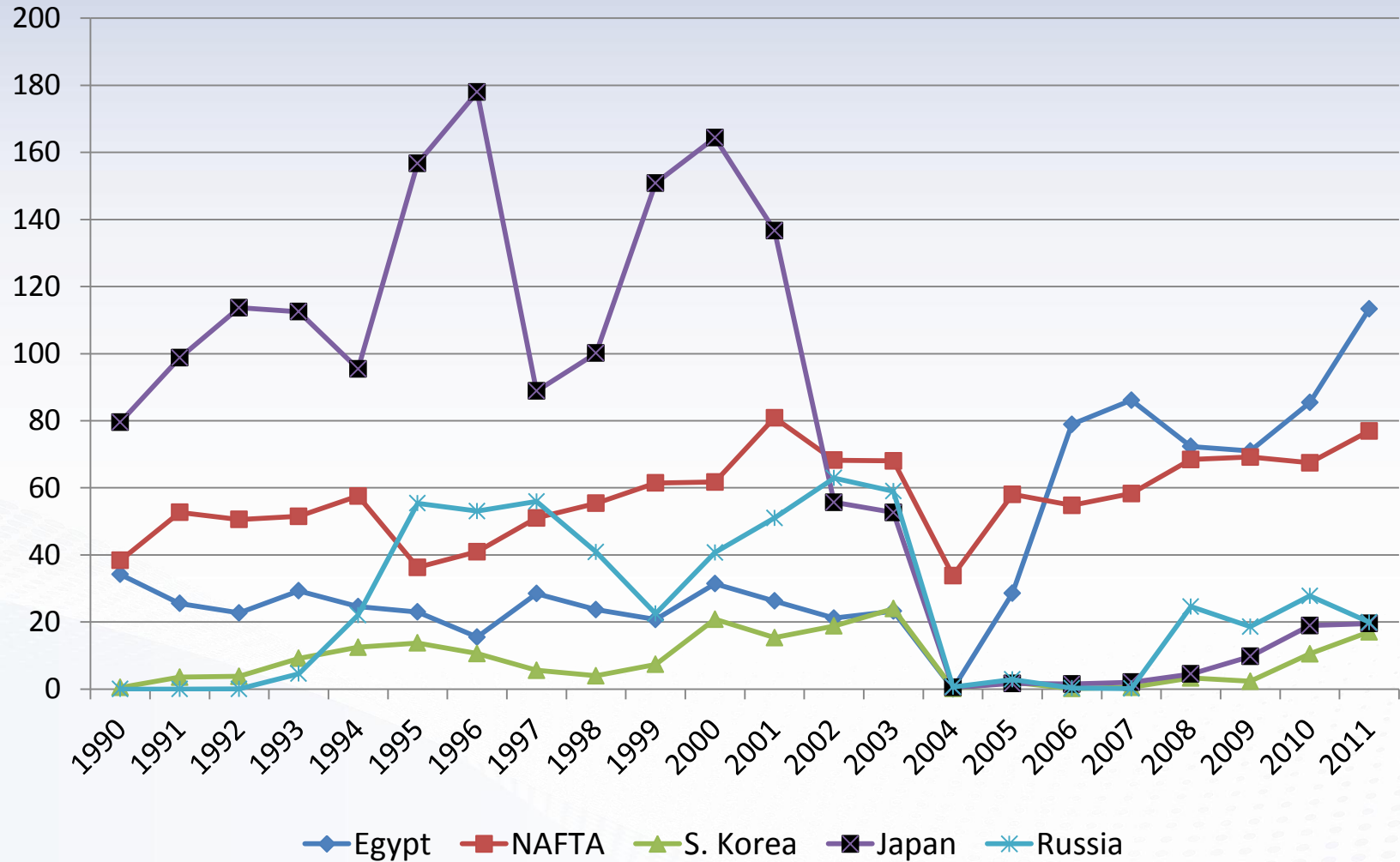
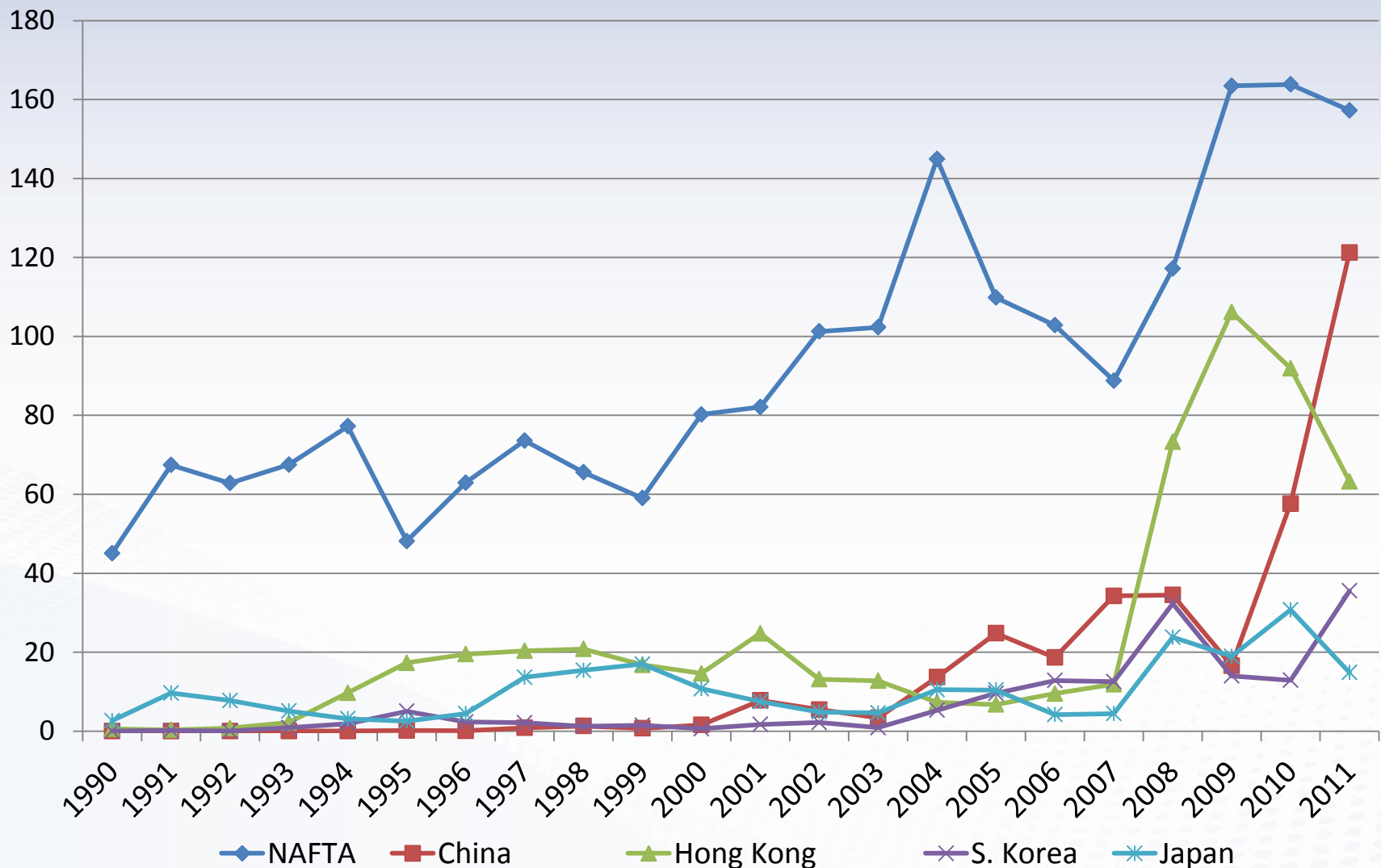


Figure 7: US pork offal exports to major markets, 1990-2011

Million Kg



◆ NAFTA
 ■ China
 ▲ Hong Kong
 × S. Korea
 ✱ Japan

Figure 8: Major world exporters of beef meat, 1999-2011

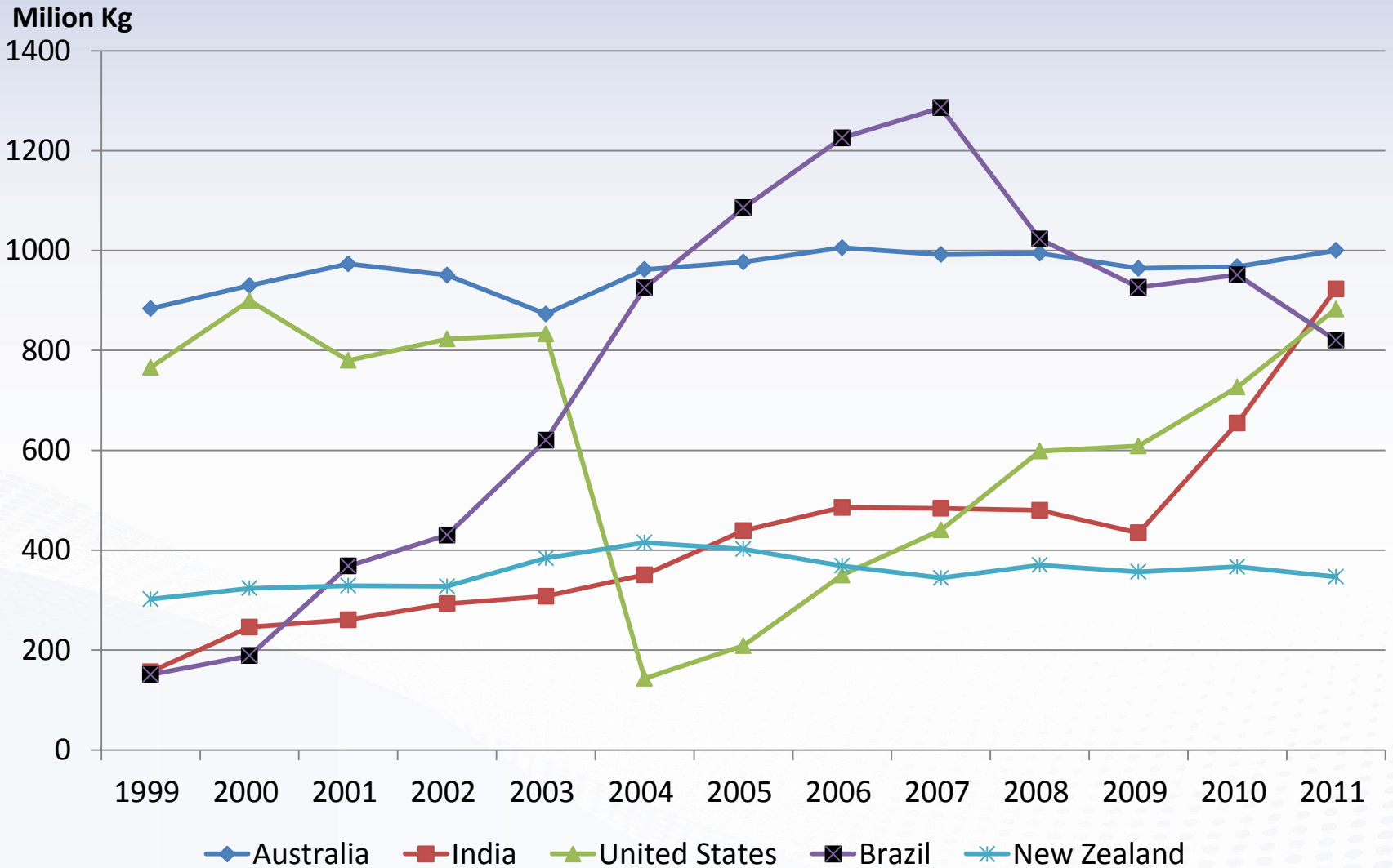


Figure 9: Major world exporters of pork meat, 1999-2011

Million Kg

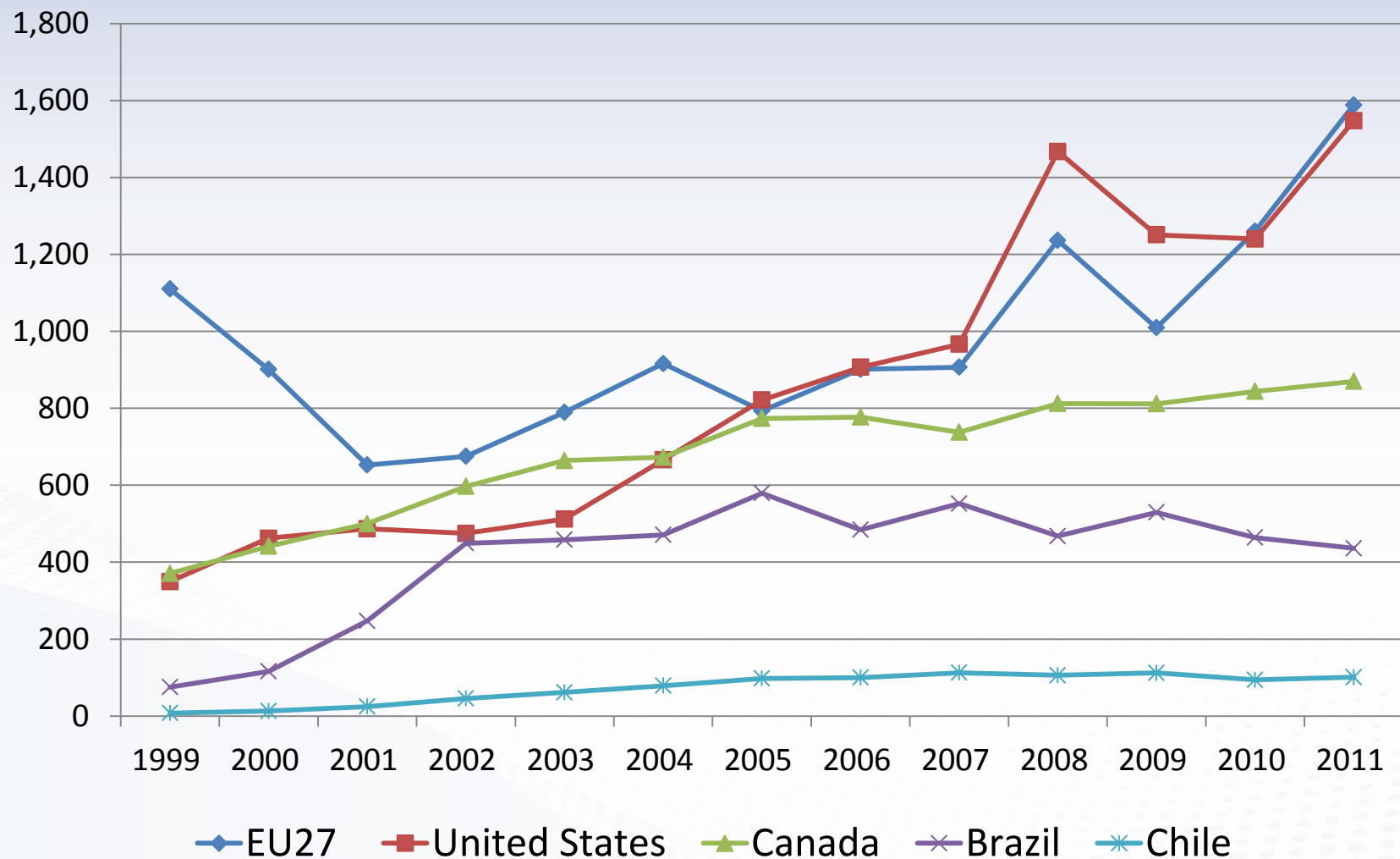
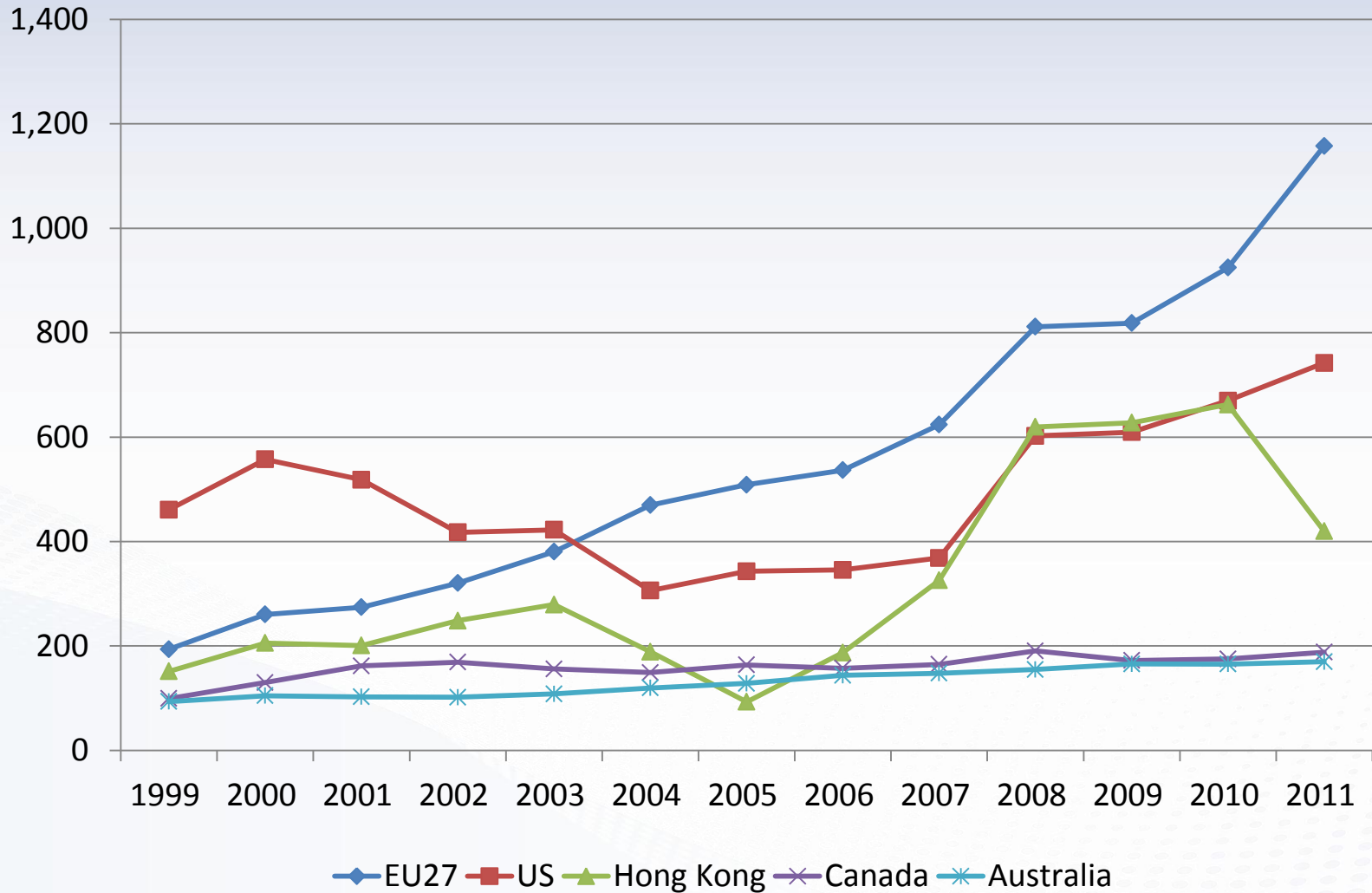


Figure 10: Major world exporters of offal (beef and pork), 1999-2011

Million Kg



—◆— EU27 —■— US —▲— Hong Kong —×— Canada —*— Australia

The Model

The analysis used an augmented vector-autoregressive model (VAR). The model was “augmented” by adding intercepts, seasonal dummies, and the first lag of export unit values as follows:

$$(1) \quad y_{i,t} = \sum_{L=1}^n \sum_j^n a_{i,j,L} y_{j,t-L} + \sum_m b_{i,m} x_{m,t} + e_{i,t}$$

Where $y_{i,t}$ are the logarithms of exports of type “i” in the month numbered “t” and $a_{i,j,L}$ are VAR coefficients. The $x_{m,t}$ are exogenous variables as defined above and the $b_{i,m}$ are their estimated coefficients. The term, $e_{i,t}$, is a random error.

Pre-Tests

- Tested exogenous variables, lag lengths, and unit roots
- Most of the monthly dummies are insignificant
- Both meats have 1 lag, both offals 2
- Exports were cointegrated with one unit root

Testing

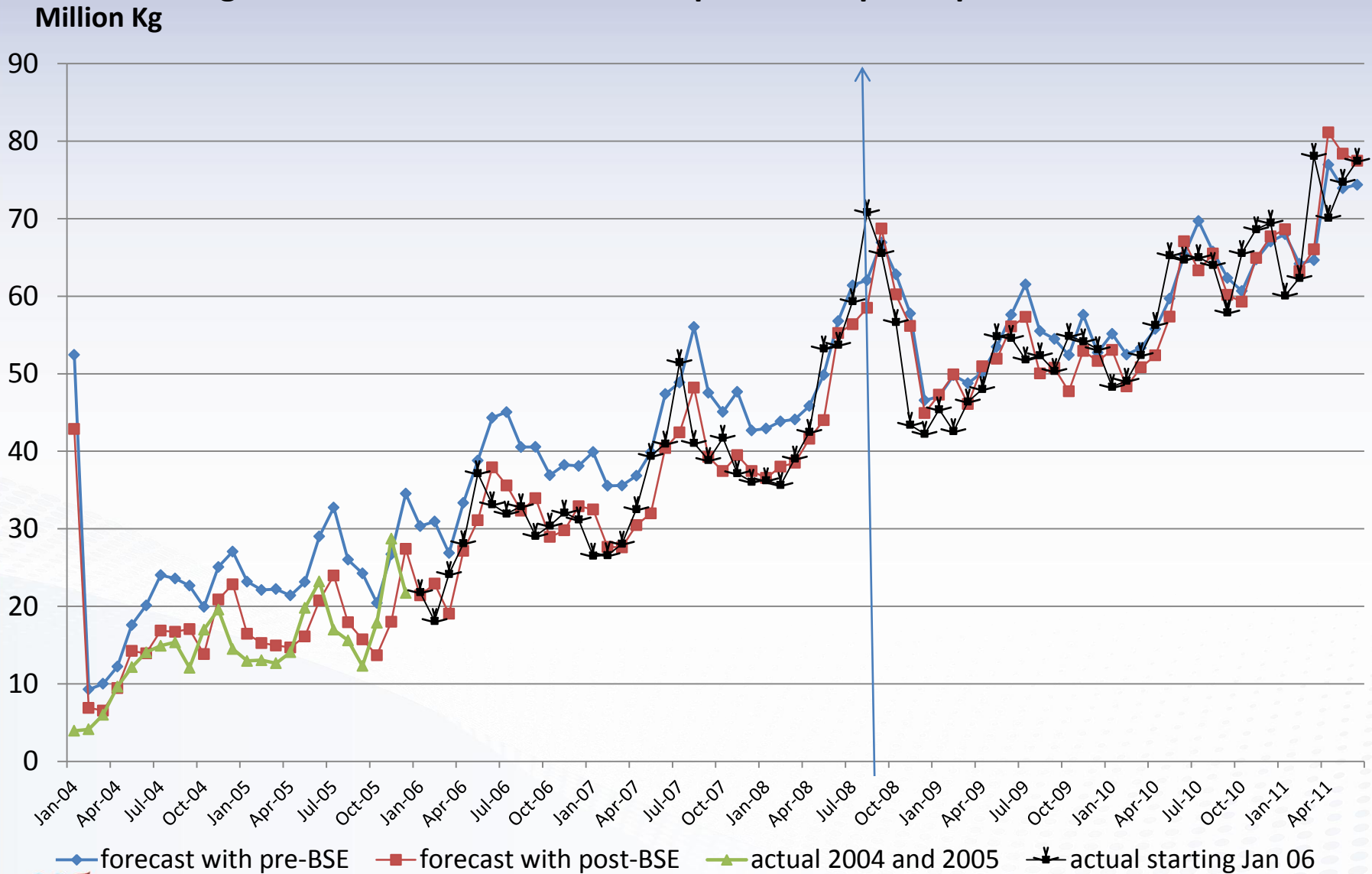
- Were the US exports of beef and pork products the same before and after BSE?
- Tests were run by defining different coefficients before and after BSE as follows:
 - The period from January 1990 to December 2003 was defined as pre-BSE.
 - The period from January 2004 and December 2005 was defined as a period of policy in flux, and was not used in model estimation.
 - The period from January 2006 to June 2011 was defined as the post-BSE period.
- Pre- and post-BSE coefficient changes were statistically significant.

Equation tests

constrained equation	Test	Degrees of Freedom	Chi-square alpha
Beef Meat	32.08	12	0.13%
Pork Meat	39.67	12	0.01%
Beef Offal	29.80	12	0.30%
Pork Offal	38.67	12	0.01%

Source: USDA-ERS calculations based on World Trade Atlas data

Figure 11: Forecast beef meat exports with pre- & post-BSE coefficients



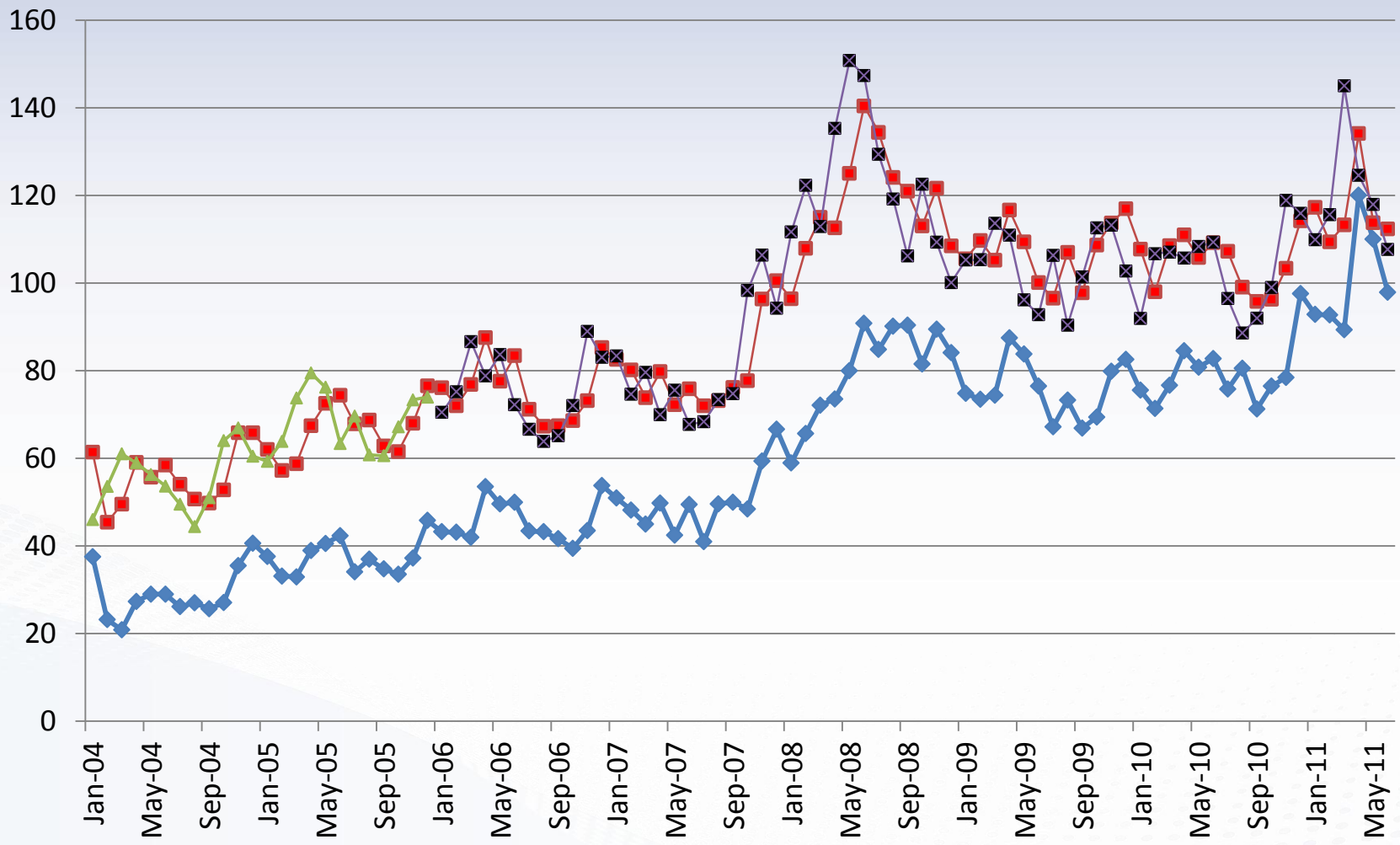
—◆— forecast with pre-BSE —■— forecast with post-BSE —▲— actual 2004 and 2005 —▼— actual starting Jan 06

United States Department of Agriculture
Economic Research Service

Source: ERS simulation model

Figure 12: Forecast pork meat exports with pre- & post-BSE coefficients

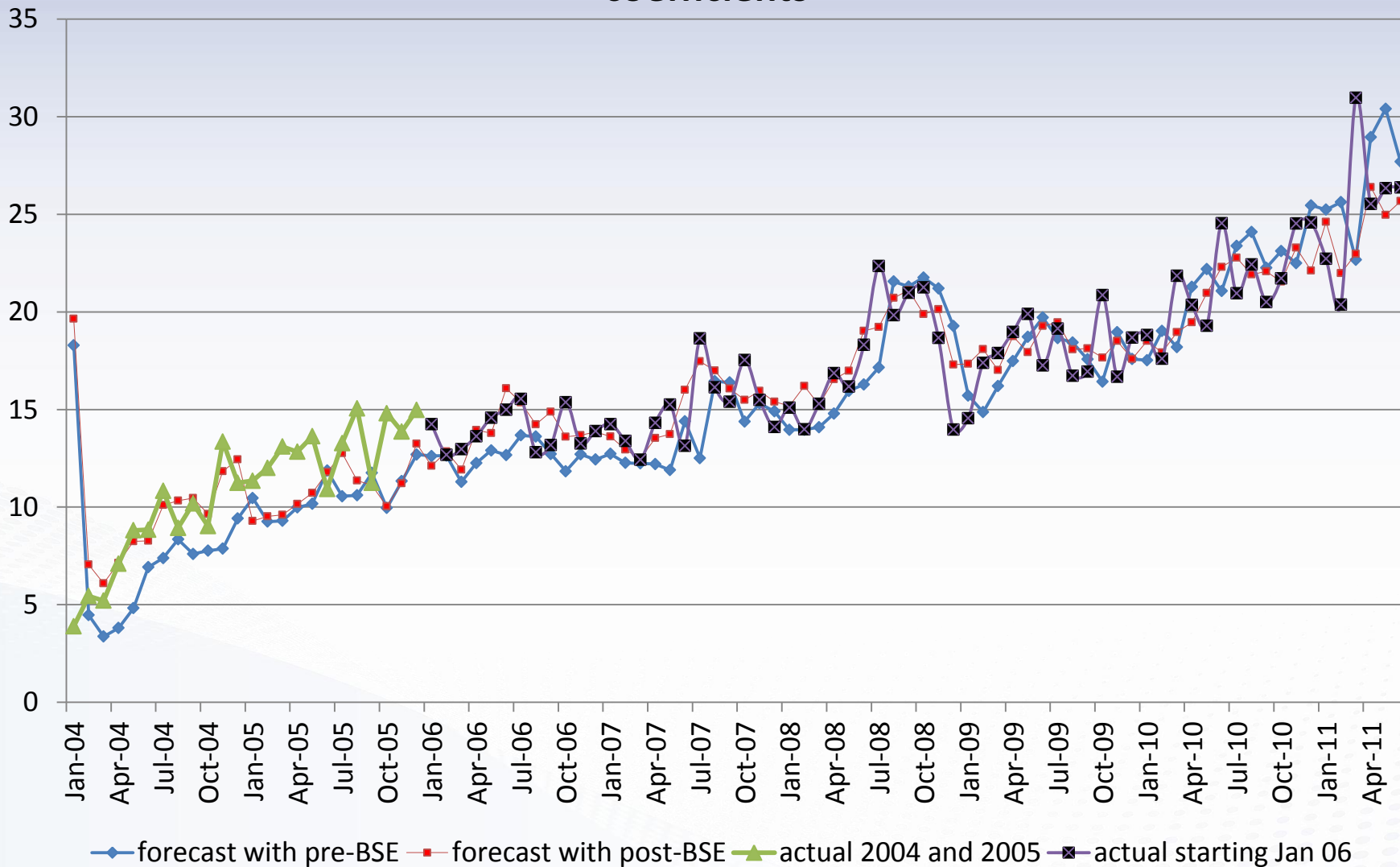
Million Kg



◆ forecast with pre-BSE ■ forecast with post-BSE ▲ actual 2004 and 2005 ✕ actual starting Jan 06

Figure 13: Forecast beef offal exports with pre- & post-BSE coefficients

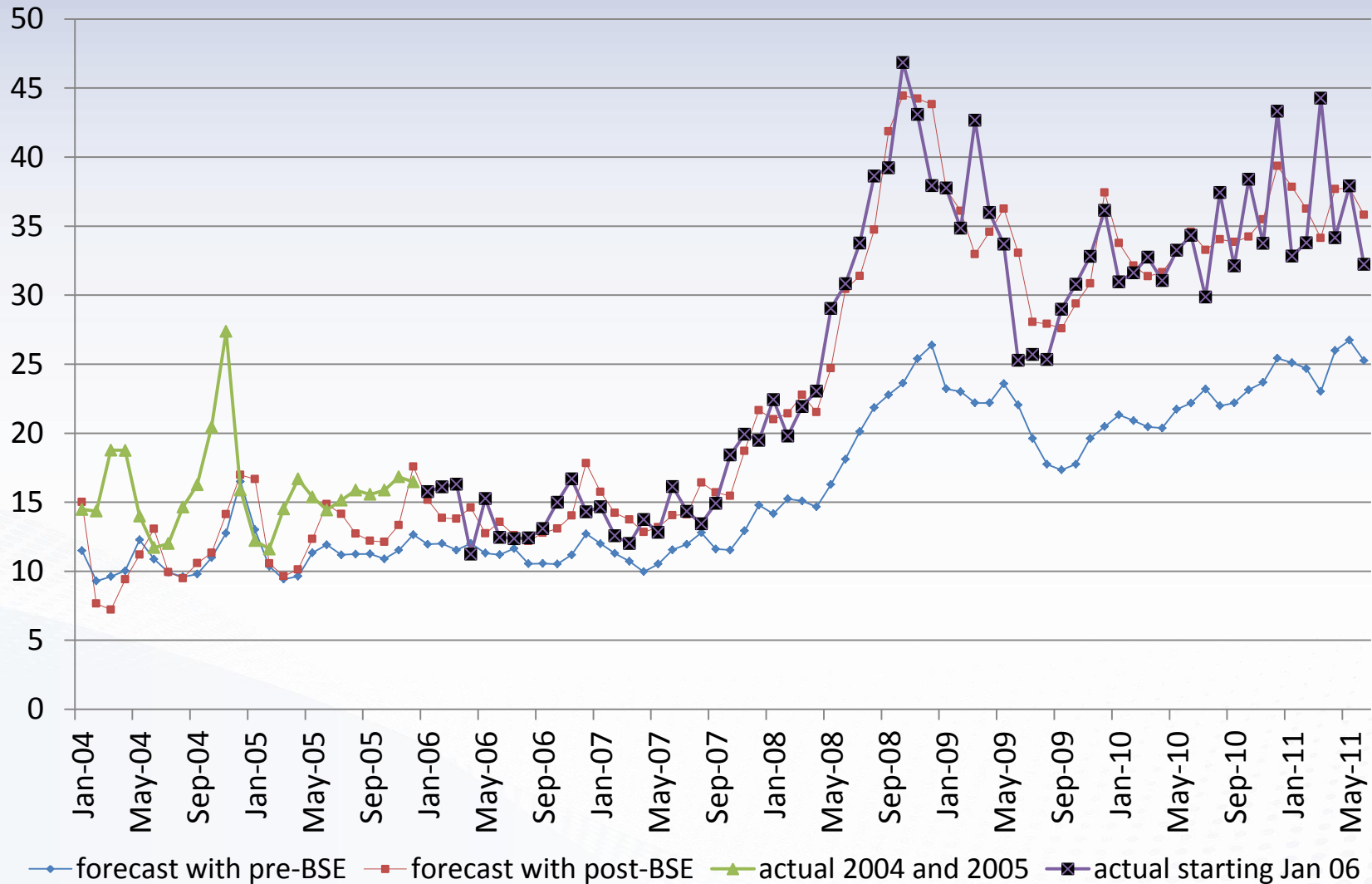
Million Kg



◆ forecast with pre-BSE ■ forecast with post-BSE ▲ actual 2004 and 2005 ✕ actual starting Jan 06

Figure 14: Forecast pork offal exports with pre- & post-BSE coefficients

Million Kg



Source: ERS simulation model

Conclusions

- The December 2003 BSE-event caused statistically significant changes in the structure of US meat exports, triggered by imposed restrictions on US beef-product imports by major countries, including Japan, South Korea, and Hong Kong.
- The BSE-event caused an immediate decline in US exports of beef meat and offal, which were regained later with new trade agreement and conditions. However, US exports of pork meat and offal rose rapidly.
- Coefficients of the pre and post-BSE equations were used to forecast US beef and pork products in the post-BSE years. Pork meat and offal exports are higher with post-BSE coefficients. Beef-export forecasts are generally lower with post-BSE forecasts.
- These shifts in demand could be driven by policy changes, demand-side effects, or supply-side effects in the United States and/or its meat-trading partners, as well as US competitors in the global market including Brazil, Australia, and India being a newly emerging meat-exporter. These issues' long term impact will be investigated in future research work.

Questions?