Did HAS Scores Impact Economic Incentives?

- A Study of Hygiene Scores in the U.K.

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New Food Safety Incentives and Regulatory, Technological, and Organizational Innovations

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Overview

- U.K. foodborne disease
  - ~60 million people, 900,000 cases per year
  - Several hundred deaths
  - Costs: about £1.5 billion (2004 prices)

Food Standards Agency: www.food.gov.uk

- Presentation Structure
  - What is HAS?
  - Review scores
    - By plant type and pre- post-HACCP
  - What changed in 2006?
  - Next steps

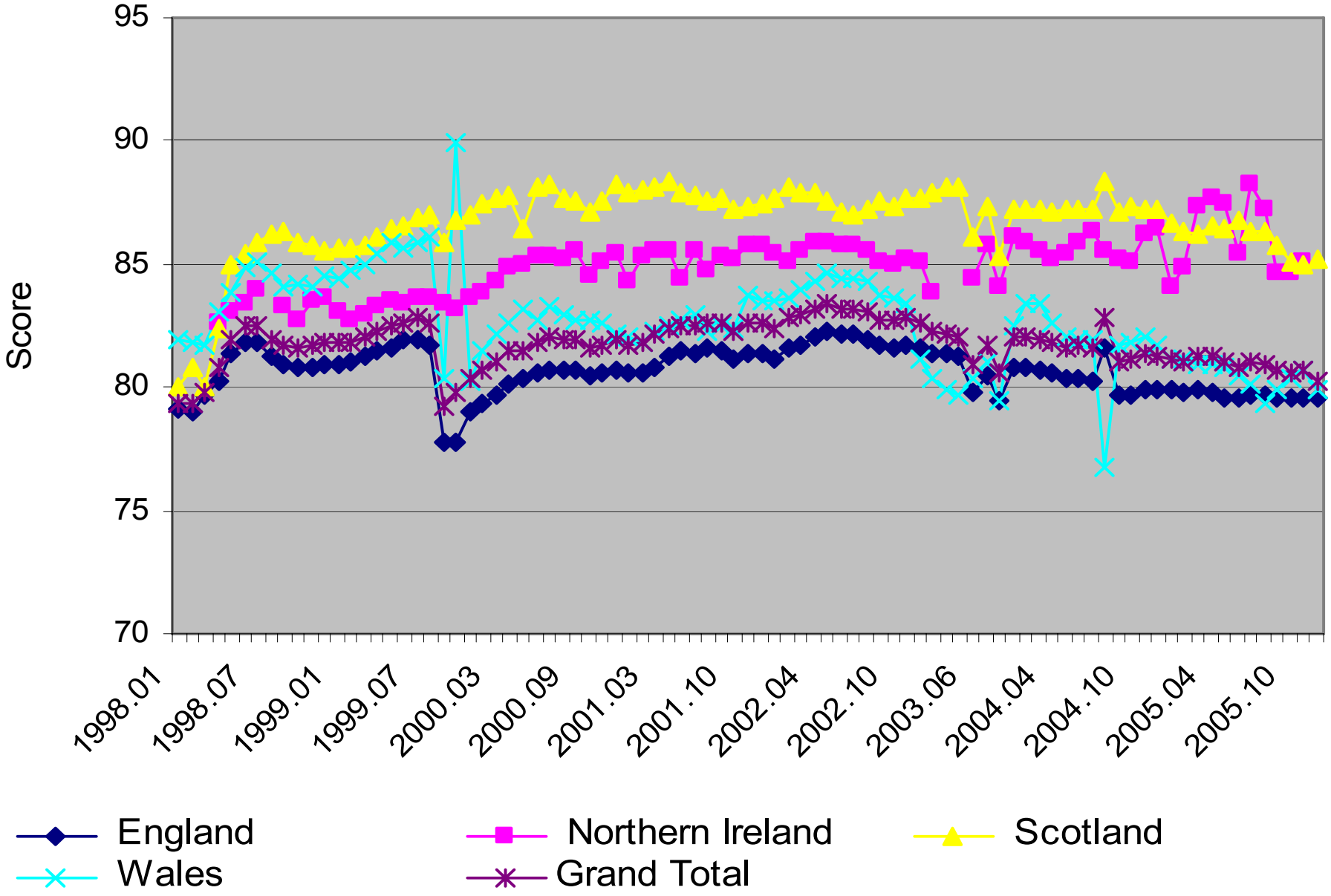
What is HAS?

- HAS = Hygiene Assessment System
- Adopted in 1997
- Hygiene standards in all slaughterhouses and cutting plants monitored monthly by MHS (Meat Hygiene Service)
- Monthly HAS scores (0-100) **published online**
  - Moving average of previous three months
- Paper uses plant-level monthly data 1998 to 2005

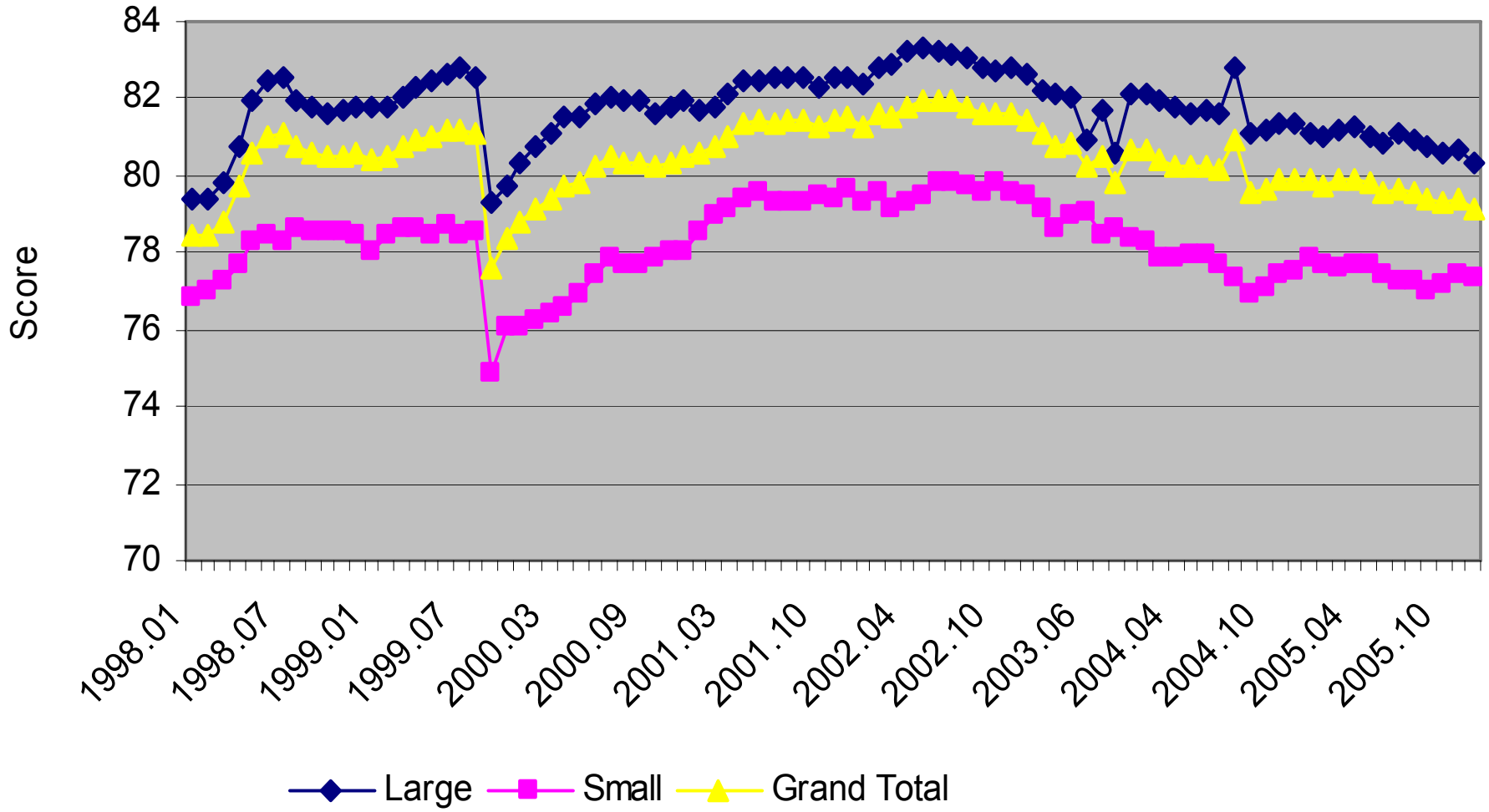
Industry Structure

Category	Grouping	Count	Percentage
Region	England	1,150	78.5%
	Scotland	135	9.2%
	Wales	98	6.7%
	Northern Island	82	5.6%
Plant Size	Large	859	58.6%
	Small	606	41.4%
Specie	Red meat only	502	34.3%
	Poultry meat only	195	13.3%
	Other	768	52.4%
Operation Type	Slaughterhouse	641	43.8%
	Cutting plants	824	56.3%

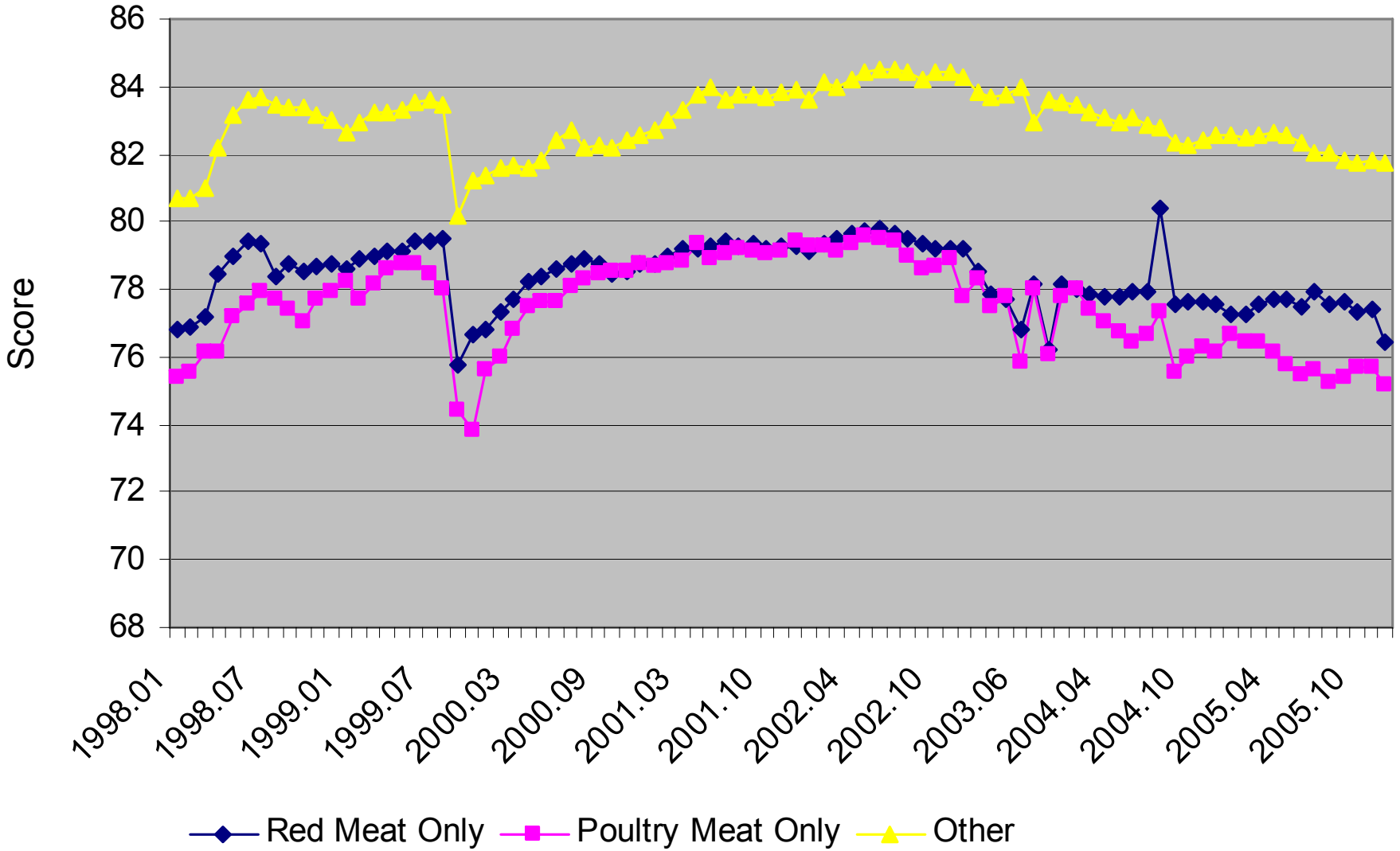
HAS Scores by Region



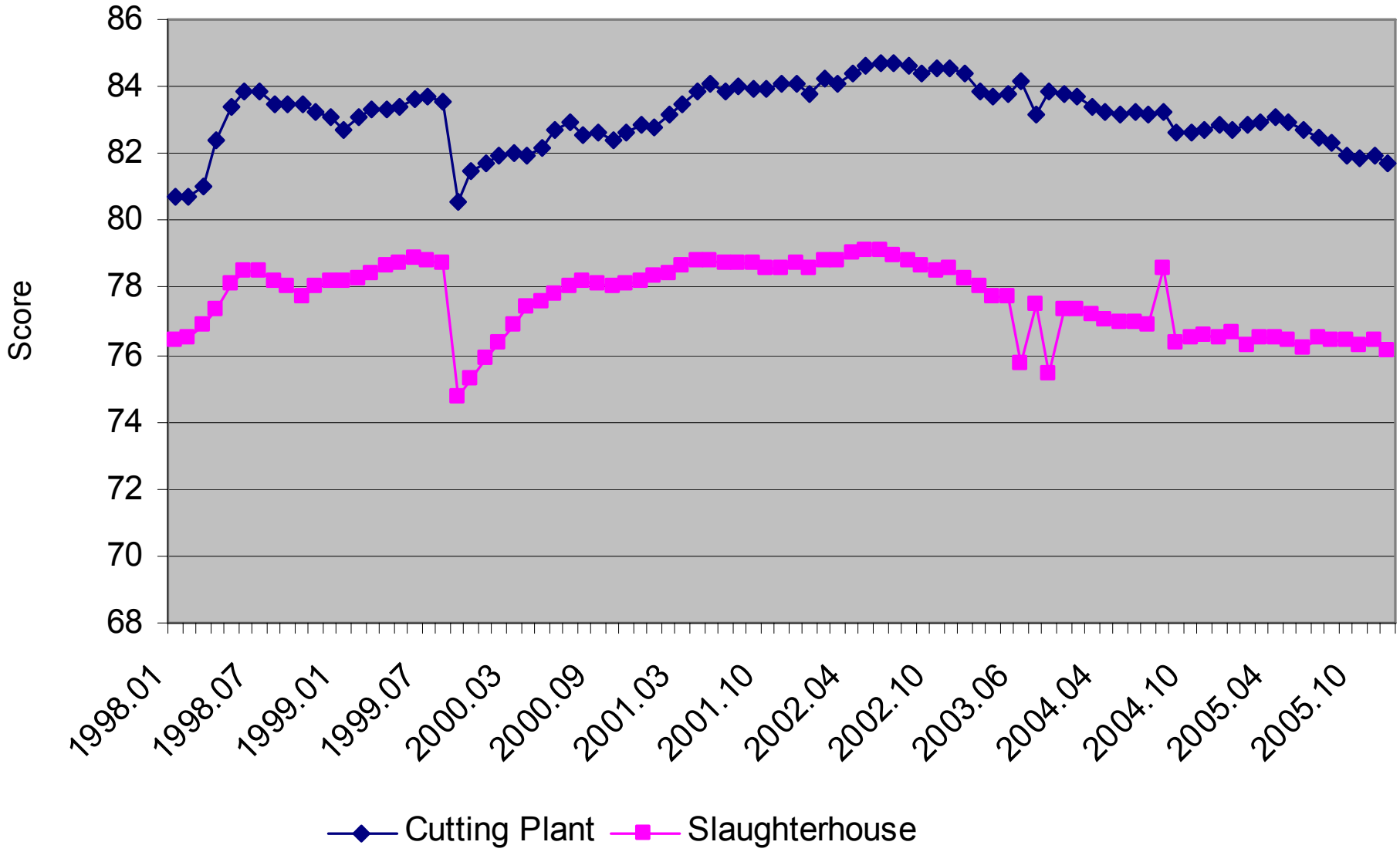
HAS Scores by Plant Size



HAS Scores by Specie



HAS Scores by Operation Type



Nonparametric Comparisons

1. Pre- and post-HACCP
2. Across four regions
   - England, Scotland, Wales, and Northern Ireland
3. Plant type
   - Large and small
   - Red meat and poultry
   - Slaughterhouses and cutting plants

What is HACCP?

- HACCP = Hazard Analysis Critical Control Point
- Internationally recognized and recommended system of food safety management
- Focuses on identifying the ‘critical points’ in a process where food safety problems (or ‘hazards’) can arise
- Puts controls in place to prevent things going wrong then monitors the process
- Record keeping is an important part of HACCP

Pre- and post-HACCP

- HACCP implementation by June 7, 2002 for large plants and June 7, 2003 for small plants
- Wilcoxon rank-sum test

- For **large plants**, no change in HAS scores pre- and post-HACCP (90% confidence level)

- For **small plants**, HAS scores went up after HACCP was implemented (99% confidence level)

Regional Differences in HAS Scores

- Friedman's distribution-free test for unordered alternatives - HAS scores differ by geographic region (99% confidence level)
- Multiple 2-way comparisons (4 regions, 6 pairs)
  - Only Scotland > England (99% confidence level)
  - No other ordering conclusions can be drawn
- Possible explanations: Scotland has different history of food safety violations; distinct red meat combinations; stronger export orientation

Differences in HAS Scores

Plant size

- Reject the null hypothesis at the 99% confidence level
- Can conclude $\theta > 0$
- Full throughput (large) premises have **higher** HAS scores than smaller (low throughput) premises

Specie

- Reject the null hypothesis at the 90% confidence level
- Can conclude $\theta > 0$
- Red meat premises have **higher** HAS scores than poultry premises

Operation type

- Reject the null hypothesis at the 99% confidence level
- Can conclude $\theta < 0$
- Slaughterhouses have **lower** HAS scores than cutting plants

What Influences HAS Scores?
Regression Results

- Larger-sized plants and plants in Scotland have **higher** scores
- Plants in Wales are more likely to have **lower** scores
- Operation type and specie don't have significant impact on HAS score
- HAS scores improved over time and following HACCP implementation

All Change!

- HAS concluded in December 2005
  - EU-wide risk-based Audit system replaced HAS
- Audit categories impacted by Food Business Operator-level (FBO) **risk factors**
  - Related to the establishment activities and nature of the food business
    - Fixed scores - higher score may be consequence of establishment's higher risk activities not necessarily reflecting performance of FBO
  - Related to the FBOs' actions
    - Based on the FBOs' actions and compliance history

Audits

Audit Category	Minimum Audit Frequency
I	At least once every 12 months
II	At least once every 8 months
III	At least once every 5 months
IV	At least once every 3 months
V	At least once every 2 months

- Slaughterhouse and cutting plant audits at least once every eight months (Category II)

First Audit Report: 271 Plants

Operating under Art. 4.5 of Reg. EC 853/2004/ Conditional approval/ Approval no.	Trading Name	Town	Audit Category	Audit Date	Note
ENGLAND					
Red Meat Slaughterhouses					
2171	A TRAVES & SON Ltd	Escrick	III	Jan-06	
6151	AGRICULTURAL & FOOD RESEARCH COUNCIL	Newbury	IV	Mar-06	
2430	ALI AKBAR SHAN	Ossett	V	Feb-06	
4360	B RILEY AND SONS	Burnley	IV	Mar-06	

- Transition from continuous numerical to categorical **risk communication**
- Comparing audit categories within plant groups

Future Research

- Case studies
  - Why certain plants and regions perform better
    - One Scottish plant scored 100 (1998 to 2004)
- Tracking the audit risk-based scheme
  - Correlations between audit category and previous HAS scores for each plant

Future Research

- Link performance measures to plant characteristics in more comprehensive models
- Absolute vs. relative performance
- Who uses this risk communication?
  - Point of purchase connection?

Thanks!

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- **Neal Hooker received a Ph.D. in Resource Economics from the University of Massachusetts then concurrently held postdoc positions at U. Mass and the Center for Food Safety at Texas A&M University. He next held an Assistant Professor position in the Department of Agricultural and Resource Economics at Colorado State University before moving to the Department of Agricultural, Environmental and Development Economics at The Ohio State University where he is an Assistant Professor. He holds a research, teaching, and extension position in the general areas of agribusiness marketing, management, policy, and international trade. Dr. Hooker is particularly interested in how agricultural and food quality characteristics, most especially safety and nutrition attributes, are communicated, controlled, and (where appropriate) certified. Dr. Hooker has published 26 journal articles and 7 book chapters on the economics of food safety and quality considering aspects such as the role of HACCP as an international trade standard, the impact of product recalls, international marketing of food safety attributes, E-Business, and comparisons of voluntary and mandatory quality management systems. He co-edited a book *Interdisciplinary Food Safety Research* and a special issue of a journal on *Private Sector Management of Food Safety*. Dr. Hooker served on a joint Institute of Medicine / National Research Council - National Academy of Sciences Committee and Sub-Committee which prepared a report *Scientific Criteria to Ensure Safe Food*. He has been a (co-) principal investigator on 18 grant and contract awards totaling more than $2.8 million.**

"New Food Safety Incentives & Regulatory, Technological & Organizational Innovations" - 7/22/2006, Long Beach, CA

AAEA section cosponsors: FSN, AEM, FAMPS, INT

Industry perspectives on incentives for food safety innovation

Continuous food safety innovation as a management strategy

Dave Theno, Jack in the Box, US

Economic incentives for food safety in their supply chain

Susan Ajeska, Fresh Express, US

Innovative food safety training systems

Gary Fread, Guelph Food Technology Centre, Canada

Organizational and technological food safety innovations

Is co-regulation more efficient and effective in supplying safer food?

Marian Garcia, Dept. of Agricultural Sciences, Imperial College London

Andrew Fearne, Centre for Supply Chain Research, University of Kent, UK

Chain level dairy innovation and changes in expected recall costs

Annet Velthuis, Cyriel van Erve, Miranda Meuwissen, & Ruud Huirne

Business Economics & Institute for Risk Management in Agriculture, Wageningen University, the Netherlands

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Regulatory food safety innovations

Prioritization of foodborne pathogens
Marie-Josée Mangen, J. Kemmeren, Y. van Duynhoven, A.H. and Havelaar, National Institute for Public Health & Environment (RIVM), the Netherlands

Risk-based inspection: US Hazard Coefficients for meat and poultry
Don Anderson, Food Safety and Inspection Service, USDA

UK HAS scores and impact on economic incentives
Wenjing Shang and Neal H. Hooker, Department of Agricultural, Environmental & Development Economics, Ohio State University

Private market mechanisms and food safety insurance

Sweden's decade of success with private insurance for *Salmonella* in broilers
Tanya Roberts, ERS, USDA and Hans Andersson, SLU, Sweden

Are product recalls insurable in the Netherlands dairy supply chain?
Miranda Meuwissen, Natasha Valeeva, Annet Velthuis & Ruud Huirne, Institute for Risk Management in Agriculture; Business Economics & Animal Sciences Group, Wageningen University, the Netherlands

Recapturing value from food safety certification: incentives and firm strategy
Suzanne Thornsbury, Mollie Woods and Kellie Raper
Department of Agricultural Economics, Michigan State University

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Applications evaluating innovation and incentives for food safety

Impact of new US food safety standards on produce exporters in northern Mexico

Belem Avendaño, Department of Economics, Universidad Autónoma de Baja California, Mexico and Linda Calvin, ERS, USDA

EU food safety standards and impact on Kenyan exports of green beans and fish

Julius Okello, University of Nairobi, Kenya

Danish *Salmonella* control: benefits, costs, and distributional impacts

Lill Andersen, Food and Resource Economics Institute, and Tove Christensen, Royal Danish Veterinary and Agricultural University, Denmark

Wrap up panel discussion of conference

FSN section rep. – Tanya Roberts, ERS, USDA

AEM section rep. – Randy Westgren, University of Illinois

INT section rep. – Julie Caswell, University of Massachusetts

FAMPS section rep. – Jean Kinsey, University of Minnesota

Discussion of everyone attending conference

Note: speaker is either the 1st person named or the person underlined.

Thanks to RTI International for co-sponsoring the workshop.

"New Food Safety Incentives & Regulatory, Technological & Organizational Innovations" - 7/22/2006, Long Beach, CA (con't)

Workshop objectives

- Analyze how new public policies and private strategies are changing economic incentives for food safety,
- Showcase frontier research and the array of new analytical tools and methods that economists are applying to food safety research questions,
- Evaluate the economic impact of new food safety public policies and private strategies on the national and international marketplace,
- Demonstrate how new public polices and private strategies in one country can force technological change and influence markets and regulations in other countries, and
- Encourage cross-fertilization of ideas between the four sponsoring sections.

Workshop organizing committee

Tanya Roberts, ERS/USDA, Washington, DC - Chair
Julie Caswell, University of Massachusetts, MA
Helen Jensen, Iowa State University, IA
Drew Starbird, Santa Clara University, CA
Ruud Huirne, Wageningen University, the Netherlands
Andrew Fearne, University of Kent, UK
Mogens Lund, FOI, Denmark
Mary Muth, Research Triangle Institute Foundation, NC
Jayson Lusk, Oklahoma State University, OK
Randy Westgren, University of Illinois, IL
Darren Hudson, Mississippi State University, MI