Potential Economic Impacts of a Highly Pathogenic Avian Influenza Outbreak on Upper Midwestern United States Table-Egg Laying Operations

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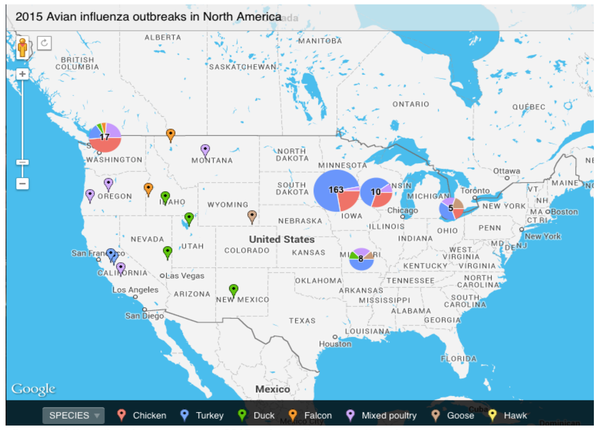
INTRODUCTION

- Outbreak of highly pathogenic avian influenza (HPAI) first reported in the United States December 19, 2014.
- Two virus strains have been found in U.S. commercial poultry flocks: H5N2 HPAI & H5N8 HPAI.
- As of July 2015 roughly 48 million birds were affected by the outbreak.
- There have been some permits issued for movement of product from uninfected premises within control areas during the current outbreak.



Source : https://batchgeo.com/map/2015-avian-influenza-outbreaks

OBJECTIVE

Estimate the economic impact of allowing movement (business continuity) from control areas of non-infected product off of monitored premises during a modeled HPAI disease outbreak.

- Each disease incidence is contained in a 10 km control area where any product is not permitted to move off any premises in this area. (No Business Continuity)
- Permitted movement from monitored farms could provide business continuity during an outbreak.

DATA

- Published budget information, supplemented with approximations and industry expertise.
- Epidemiological disease spread data through the North American Animal Disease Spread Model (NAADSM).
- Egg Industry Center
- United States Department of Agriculture's: World Agricultural Supply and Demand Estimates (WASDE), National Agricultural Statistics Service (NASS), Economic Research Service (ERS), and Agricultural Marketing Service (AMS).

ANALYSIS

A partial equilibrium model of the U.S. Egg Industry was used to estimate the economic consequences of allowing permitted movement of egg products during a modeled outbreak using the most likely disease spread scenario.

Key Behavioral Equations

(1) Global Market Clearing

$$q_i \hat{q}_i + I_{i,t-1} \hat{I}_{i,t-1} = (X_i - M_i)(\widehat{X_i - M_i}) + D_i \hat{D}_i + I_{i,t} \hat{I}_{i,t}$$

(2) Market Price

$$\hat{P}_i = \theta_{l,i} \hat{w} + \theta_{e,i} \hat{P}_e + \theta_{k,i} \hat{r}_i$$

(3) Production Diversion to Table or Processed Eggs

$$\hat{E} = \lambda_{e,te} \hat{q}_{te} + \lambda_{e,pe} \hat{q}_{pe} + \lambda_{e,te} \hat{a}_{e,te} + \lambda_{e,pe} \hat{a}_{e,pe}$$

(4) Capacity Constraint

$$\hat{k}_i = \hat{a}_{k,i} + \hat{q}_i$$

(5) Final Demand

$$\hat{D}_i = \hat{\gamma}_i + \varepsilon_{i,i} \hat{P}_i + \varepsilon_{i,j} \hat{P}_j$$

Where:
i = Table Eggs, Processed Eggs
e = Shell Eggs
k = Capital
l = Production Inputs

HPAI Disease Impacts in Minnesota (% Changes)

	Business Continuity		No Business Continuity	
	Quarter 1	Quarter 2	Quarter 1	Quarter 2
Shell Egg Price	9.15%	1.50%	12.31%	1.55%
Table Egg Price	6.78%	2.99%	8.38%	3.03%
Processed Egg Price	2.60%	0.98%	3.25%	0.99%
Production Table Eggs	-0.18%	1.67%	-0.92%	1.68%
Production Processed Eggs	-4.39%	-0.16%	-6.14%	-0.20%
Net Exports Table Eggs	3.97%	1.75%	4.90%	1.78%
Net Exports Processed Eggs	0.65%	0.24%	0.81%	0.25%
Demand Table Eggs	-3.26%	-1.46%	-4.02%	-1.49%
Demand Processed Eggs	-1.07%	-0.34%	-1.36%	-0.34%

HPAI Disease Impacts for the Rest of U.S. (% Changes)

	Business Continuity		No Business Continuity	
	Quarter 1	Quarter 2	Quarter 1	Quarter 2
Shell Egg Price	1.36%	1.37%	2.19%	2.21%
Table Egg Price	2.85%	2.89%	3.27%	3.31%
Processed Egg Price	0.98%	0.97%	1.16%	1.15%
Production Table Eggs	1.64%	1.67%	1.45%	1.47%
Production Processed Eggs	-0.06%	-0.08%	-0.52%	-0.54%
Net Exports Table Eggs	1.67%	1.69%	1.91%	1.94%
Net Exports Processed Eggs	0.24%	0.24%	0.29%	0.28%
Demand Table Eggs	-1.39%	-1.41%	-1.59%	-1.61%
Demand Processed Eggs	-0.36%	-0.35%	-0.44%	-0.42%

RESULTS

- Stop movement orders have serious daily adverse consequences for average sized egg producers located within a control area, $0.05¢/hen housed or $5,500 for a 110,000 bird layer house.
- Minnesota table egg price estimated to rise by 1.6% (3¢/dozen) more without business continuity.
- Table egg retail price in the first quarter estimated to be $2.09/dozen for rest of U.S. (-1.88 ¢/ dozen difference from actual January-March 2015 U.S. average retail price.)
- Business continuity allows non-infected premises to move products which reduces the impact of an HPAI outbreak to consumers by mitigating price increases and affected producers by reducing the loss of potential revenue.

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