Understanding the Relationship of Bio-Security and Production Performance in the Poultry Industry

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Outline for Today's Talk

- Our PREISM Project
  - Our preliminary model
  - Our survey of grower performance and biosecurity
- The importance of considering the industry structure when evaluating indemnification incentives
- Factors that we believe determine whether tiered indemnification will work.

Our Research

- **Economic Efficiency and Equity of Alternative Government Programs for Invasive Species: A Decision Model of Government Action**
- This research provides a theoretical framework for empirically testing the relationship between APHIS indemnity payments and biosecurity preventive measures by livestock producers
- Case study of Avian Influenza in poultry
- Worked closely with Veterinarians in our College of Veterinary medicine who work on poultry disease issues.

Government's policy for animal disease

1. E*x post* indemnification programs as typically administered by APHIS
2. *A prior* insurance or indemnification programs as offered by RMA
3. Incentivized indemnification that ties higher coverage to explicit risk reducing production practices

Poultry Avian Influenza Bio-security

- Highly integrated industry
- Very contagious
- World wide spread
- Potential health risk for people
- Great influence to poultry product export and price
- Low Pathogenic Avian Influenza & High Pathogenic Avian Influenza

Conceptual Framework

- Risk averse integrators
- Has a choice of using bio-secure or insecure growers
- Bio-secure farms are slightly less productive and slightly less risky
- The government offers indemnification with a deductible on AI
- There are two diseases both requiring bio-security to mitigate
- government does not indemnify the other disease which also causes death loss and it creates a price shock
- An indemnity penalty for high risk farms suffering loss (assuming observability)

Simulation procedure

- We model the probability of AI and LT disease losses for bio-secure and insecure farms based on historical data
- Price is also random and negatively correlated with an outbreak
- Random variables are model with the Anderson, Harri, and Coble Multivariate simulation procedure (JARE, 2009)

Conclusion

- Factors encouraging more Bio-security
  - Price reductions when an outbreak occurs
  - The risk aversion level of integrator
  - Share of output lost if an outbreak
  - Probability of other diseases outbreak
  - Deductible level
  - Indemnity penalty
- Caveat: our assumption that bio-security is negatively correlated with output
  - No scientific studies in poultry addressing the issue

Is Biosecurity Output Decreasing?

While biosecurity is not without costs, it may not be output decreasing. Also, costs are off set when the probability of an event is high.

We have two case where biosecurity incentives may be necessary:

(1) Biosecurity is output decreasing and the event probability is low.

(2) The firm's optimal level of biosecurity is less than the policy desired minimum.

Further examination of output/biosecurity trade off.

- With the help of a large poultry integrator we surveyed contract-growers to assess if more biosecure growers were on relatively less productive.
- The survey questionnaire was administered by field managers who worked for the integrator.
- We receive 466 responses.

Bio-security and Production Performance Assessment

Complex: _____ Service Tech: _____ Farm_____

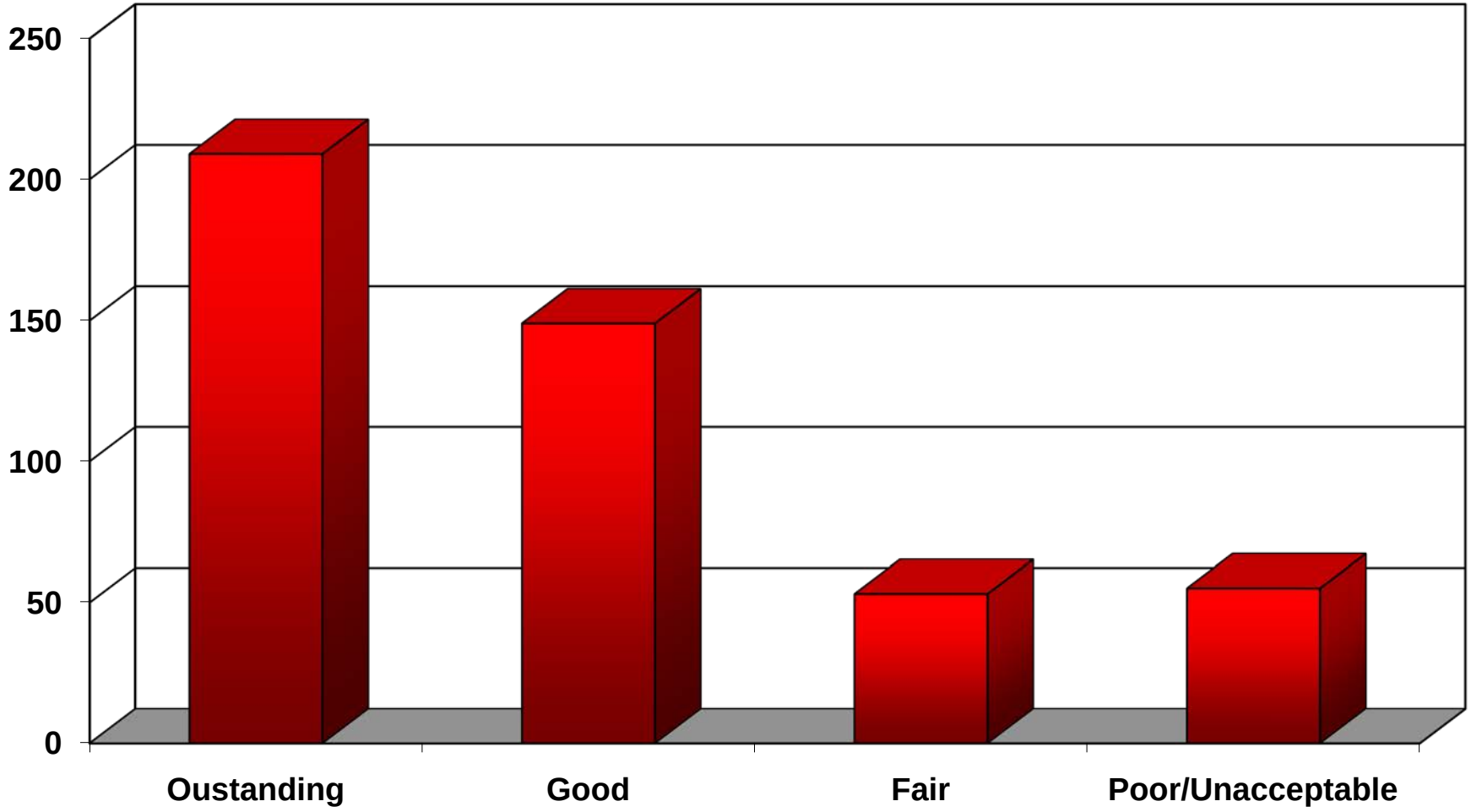
Grade Questions	Grade the farm on a 100 point scale. (100-90 is outstanding, 89-80 is good, 79-70 is fair, 69-60 is poor, and below 60 is unacceptable)
1. Farm workers avoid sharing equipment with other growers or if they do share equipment, they sanitize the equipment.	
2. Farm workers wear footwear and other clothing that are only worn on the premises to avoid 'tracking in' disease.	
3. Farm workers avoid visiting other poultry chicken houses or follow the steps to sanitize themselves if they do.	
4. Visitors are required to disinfect their footwear in footbaths or wear coveralls and boots	
5. Farm workers clean manure, mud or debris from vehicle, boots, and then disinfect the tools which are used for cleaning.	
6. Facilities have rodent control programs and are relatively rodent free.	
7. Other domesticated animals and waterfowl are kept at least 150 feet from poultry buildings.	
8. Grass and weeds are mowed and the farm is neatly maintained	
9. Poultry building control rooms are neat and clean.	
10.The farm maintains good insect control	
Performance: The production performance of this farm ranked _____ out of _____ in 2008.	

Bio-security and Production Performance Assessment

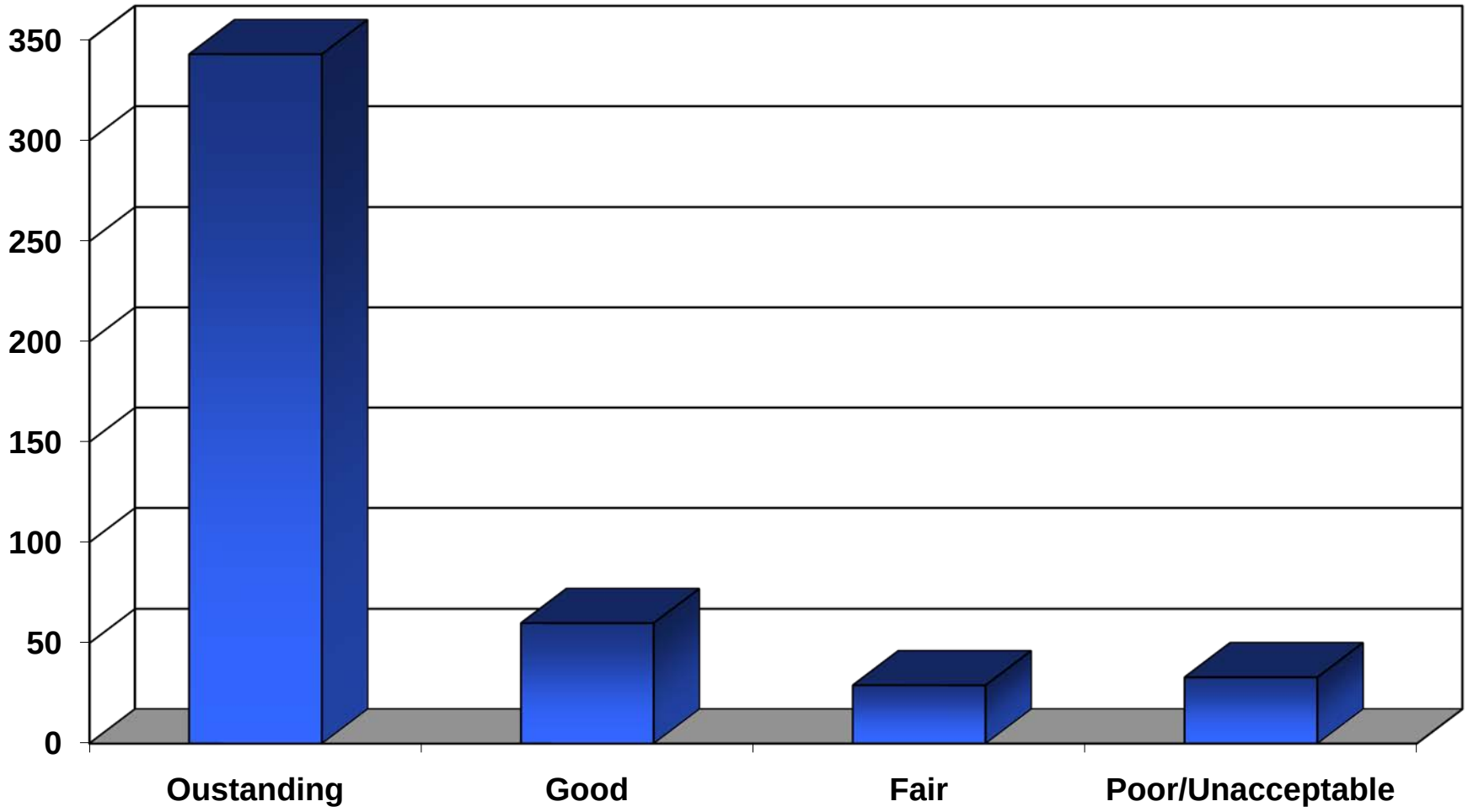
Complex: _____ Service Tech: _____ Farm_____

Other Questions	
1. How many family members have chicken farms?	Number
2. How many chicken houses are on the farm?	Number
3. How many non-company farms poultry houses are with in 0.5 miles of the farm?	Number
4. What is the distance from the farm to a road that regularly has vehicles carrying poultry?	Miles
5. Does the grower own more than one chicken farm?	Circle Yes or No
6. Does the farm have chicken houses on more than one location?	Circle Yes or No
7. Does the farm regularly use hired labor?	Circle Yes or No
8. Does the primary farm operator also work off farm?	Circle Yes or No
9. Is there a compost shed or dry litter shed on the farm?	Circle Yes or No
10. Is there an area where waterfowl congregate within 0.5 miles of the farm?	Circle Yes or No

Farm workers clean manure, mud or debris from vehicle, boots, and then disinfect the tools which are used for cleaning.



Other domesticated animals and waterfowl are kept at least 150 feet from poultry buildings.



Service Tech's suggest these Bio-security Measures are Positively Correlated with each other

Farm workers avoid sharing equipment with other growers or if they do share equipment, they sanitize the equipment.
Farm workers wear footwear and other clothing that are only worn on the premises to avoid 'tracking in' disease.
Farm workers avoid visiting other poultry farms or sanitize themselves if they do.
Visitors are required to disinfect their footwear in footbaths or wear disposable shoe covers.
Farm workers clean manure, mud or debris from vehicle, boots, and then disinfect the tools which are used for cleaning.
Facilities are free of rodents.
Other domesticated animals and waterfowl are kept off of the premises.
Grass and weeds are mowed
Poultry control room is neat and clean

Regression Results: Dependant Variable Tournament Percentile

Variable	Parameter	Pr > |t|
Intercept	-15.053	0.635
Farm workers avoid sharing equipment with other growers or if they do share equipment, they sanitize the equipment	0.166	0.274
Farm workers wear foot wear and other clothing that are only worn on the premises to avoid 'tracking in" disease	0.344	0.127
Farm workers avoid visiting other poultry chicken houses or follow the steps to sanitize themselves if they do	-0.107	0.588
Visitors are required to disinfect their footwear in footbath or wear coveralls and boots	**-0.402**	**0.065**
Farm workers clean manure, mud or debris from vehicle, boots, and then disinfect the tools which are used for cleaning	-0.320	0.194
Facilities have rodent control programs and are relatively rodent free	***0.862***	***0.0003***
Other domesticated animal and waterfowls are kept at least 150 feet from poultry buildings	-0.161	0.169
Grass and weeds are moved and the farm is neatly maintained	-0.019	0.727
Poultry building control rooms are neat and clean	-0.094	0.611
The farm maintains good insect control	***0.402***	***0.056***
How many family members have chicken farms?	***2.701***	***0.0279***
How many chicken houses are on the farm?	-0.571	0.449
Does the grower own more than one chicken farm?	***0.677***	***0.086***
What is the distance from the farm to a road that regularly has vehicle carrying poultry?	1.005	0.176
Is there an area where waterfowl congregate within 0.5 mile of the farm?	5.679	0.260
Does the farm has chicken houses on more than one location?	-4.592	0.553
Does the farm regularly use hired labor?	1.699	0.572
Does the Primary farm operator also work off farm?	-4.627	0.196
Is there an area where waterfowl congregate within 0.5 mile of the farm?	-1.843	0.701
Is there a compost shed or dry litter shed on the farm?	-5.515	0.119

Regression Results Focusing In

Variable	Parameter
Visitors are required to disinfect their footwear in footbath or wear coveralls and boots	**-0.402**
Facilities have rodent control programs and are relatively rodent free	***0.862***
The farm maintains good insect control	***0.402***
How many family members have chicken farms?	***2.701***
Does the grower own more than one chicken farm?	***0.677***

- Model $R^2 = 0.12$ Bio-security explains little of the poultry growers performance
- Regression effects are of mixed signs – some biosecurity increases output while others do seem to conflict with increased output
- What to make of BMPs

What are The Implications?

THOUGHTS ON INDUSTRY STRUCTURE AS IT RELATES TO BIOSECURITY

Unique aspects of Poultry Disease Policy

- Poultry
- Much of bio-security is generic rather than disease specific
- The integrator tightly supervises the farm (weekly visits)

- Beef
- Much of bio-security is generic rather than disease specific
- No real outside monitoring system

Contrast of Industry Structure and how it Affects Disease Risk Management

- Poultry
- Vertically integrated into all production stages - The integrator owns the birds
- Farmers are paid based on relative rate of gain efficiency and largely face business interruption risk

- Beef
- Some integration from packers into feedlots and some retained ownership by cow/calf operators
- Farmers typically own the animals and are exposed to that financial risk

Contrast of Industry Structure and how it Affects Disease Risk Management

- Poultry
- The integrator can cut off growers and has an inspection system
- Concerned about non-indemnifiable disease that cause mortality and export restrictions (price-shocks)

- Beef
- Numerous small-scale independent operators
- Concerned about non-indemnifiable disease that cause mortality and export restrictions (price-shocks)

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Effectiveness of Tiered Indemnification

Effective		Ineffective
Negative relationship between output and biosecurity	⟷	Positive or insignificant relationship between output and biosecurity
The program disease is the primary disease for the industry	⟷	There are non-program diseases of importance to the industry
Mitigation practices are unique to the program disease	⟷	Mitigation practices are common for all diseases
Mitigation practices are observable	⟷	Mitigation practices are not observable
No adverse price shocks are associated with the disease	⟷	Adverse price shocks are associated with the disease
Given a price shock, a representative firm is small relative to the industry	⟷	Given a price shock, a representative firm is large relative to the industry