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Incentivizing the buyer/supplier relationship for food safety

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February 2, 2010

Washington DC



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Outline

- Imperfect information in the food supply chain.
- Unpleasant economic consequences.
- Mitigating the effects of imperfect information
- Mitigating imperfect food safety information
- A segregating contract.
- Levers and Feedback



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Imperfect information in the food supply chain

- Imperfect information refers to hidden actions or hidden types.
- Hidden action = Is supplier making safe food?
- Hidden type = Is that supplier a safe supplier?
- Uncertainty and inaccuracy in measuring food safety leads to imperfect information.



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Unpleasant economic consequences

- Moral hazard = supplier exerts less effort on safety than is optimal for the buyer.
- Adverse selection = contract provisions appeal to unsafe suppliers, and not to safe suppliers.
- Economists use principal-agent models to evaluate imperfect information problems



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Imperfect information problems

<i>Principal</i>	<i>Agent</i>	<i>Information</i>
Me	My accountant	Did she fill out my tax return correctly?
GEICO	Me	Is Drew driving safely?
Me (Stockholder)	Board of Directors	Is the board pursuing the my best interest?
Me	Used Car Dealer	Is the car a lemon?
My employer	Me	Did Drew actually go to all those conference sessions?



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Mitigating effects of imperfect information

- **Bonding/insurance**
 - Pay someone else to bear the risk.
- **Warrantees/guarantees**
 - Buyer shares risk with supplier.
- **Signaling**
 - Sharing good information ("certified organic")
- **Testing/inspection**
 - Changes the allocation of information



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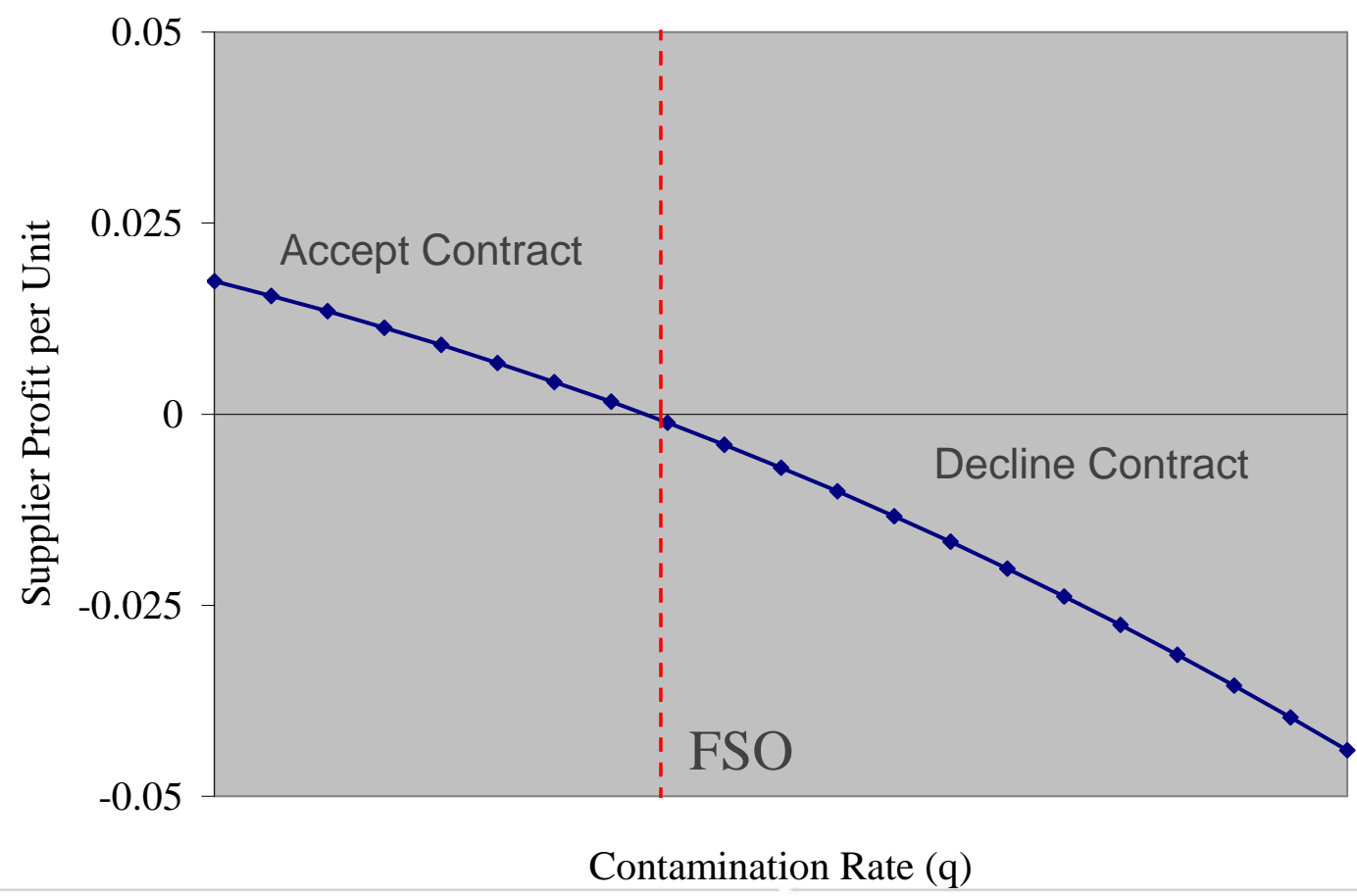
Mitigating imperfect food safety information

- Testing
 - Buyer gathers information about safety
- Traceability
 - Source of unsafe food can be identified
- Penalties
 - Cost of unsafe food allocated to the responsible party.



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A Segregating Contract/Regulation





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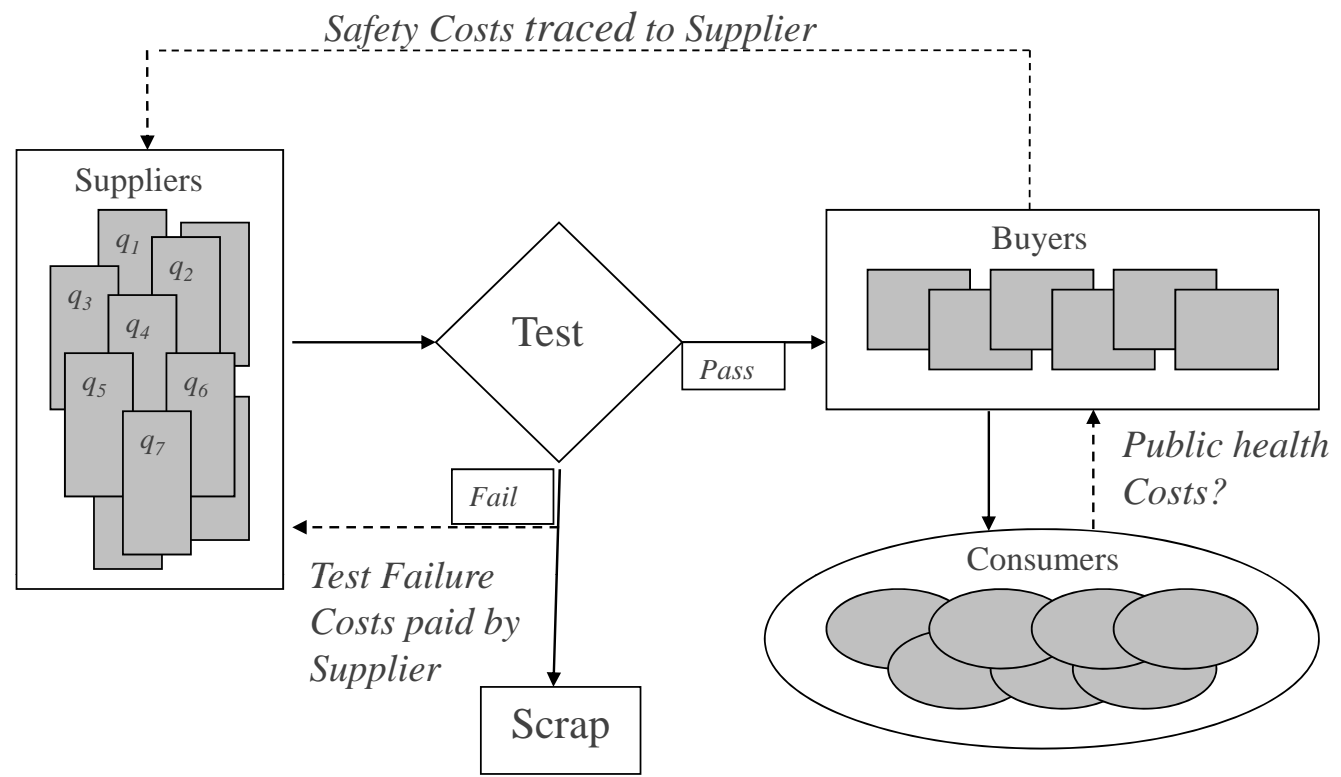
Levers

- Probability of getting caught
 - Influenced by sensitivity, specificity, sampling error
- Traceability
 - Identifying the responsible supplier
- Penalties
 - Inspection failure costs
 - Public health costs (direct costs vs. indirect cost)



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Economic Feedback





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Feedback event probabilities depend on....

- Sampling error
 - Sample not representative of the lot
- Diagnostic errors
 - False negative = safe test from an unsafe sample
 - False positive = unsafe test from a safe sample



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Probability tree is complex....

Lot	Sample	Test result	Event
Unsafe	Unsafe	Unsafe	Inspection failure
		Safe (<i>false negative</i>)	Public health failure
	Safe (<i>sampling error</i>)	Unsafe (<i>false positive</i>)	Inspection failure
		Safe	Public health failure
Safe	Unsafe (<i>sampling error</i>)	Unsafe	Inspection failure
		Safe (<i>false negative</i>)	No cost
	Safe	Unsafe (<i>false positive</i>)	Inspection failure
		Safe	No cost



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Segregating contracts are possible...

- Higher failure costs
- Greater traceability, if sampling error and diagnostic error are present.
- Less sampling and diagnostic error.
 - Note: more inspection error may provide greater economic incentive to supplier if penalties are high and traceability is high.



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Implications

- Contracts (and regulations) can be written to make unsafe suppliers unprofitable.
- Levers are penalties, traceability, and inspection accuracy.
- Traceability is low in imported food, so inspection is critical.
- Sampling error is the big question.