

# Optimal Invasive Species Policies Under Asymmetric Information

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# Overview

- Invasive Species Problem
- Model Components
- Export/Import Policy Analysis
  - One Importer
    - Adverse Selection
    - Moral Hazard
  - Several Importers

# Invasive Species Problem

- Unintentional inclusion of a harmful pest in shipment of a valuable good.
- The crop itself or a byproduct such as soil born insect on plants for planting or on wood packaging material
- Risk varies by exporter
- Exporters can undertake effort to abate risk
- Importing country can conduct border inspection

# Model Components

- Presence of Invasive: Probability of “infected” is function of idiosyncratic risk factor  $\theta$ , abatement effort  $a$ , and technical assistance  $\tau$ .
  - $\theta$  exogenous, private info to exporter
  - $a$  endogenous, private info to exporter
  - $\tau$  chosen by regulator, public info
- Importer chooses: Probability of Inspection Success,  $I$
- Convex cost of inspection:  $c(I)$

# Model Components

- Regulator's Objective: Maximize expected social welfare
  - Accounts for cost of inspection, expected damage from invasive, *depreciated* value of good to domestic consumers.
  - Increases in inspection intensity reduce value of passed shipment to both exporter and consumer.

# Model Components

- Regulator's choice
  - Inspection intensity, transfers, uniform technical assistance
  - Participation constraint.
    - All exporters must still be willing to ship under inspection regime (positive payoff)
  - Incentive compatibility constraint
    - Exporters must be willing to voluntarily choose inspection/transfer “assigned” to them.

# Policy Scenarios

- Multiple importers differing by benefit from good and potential damage from invasive.  
(NAPPO case)
  - Non-cooperative solution
  - Potential benefits from coordination  
(pre-clearance, prevention, technical assistance)

# Case Studies

- North American Plant Protection Organization
- Wood packaging-wood boring insects
- Netherlands bulb industry-soil born pests
- Seed potato from Canada to Mexico
- Horticulture informal clean stock program