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# Issues in Modeling Bioterrorism in the Agrifood Sector

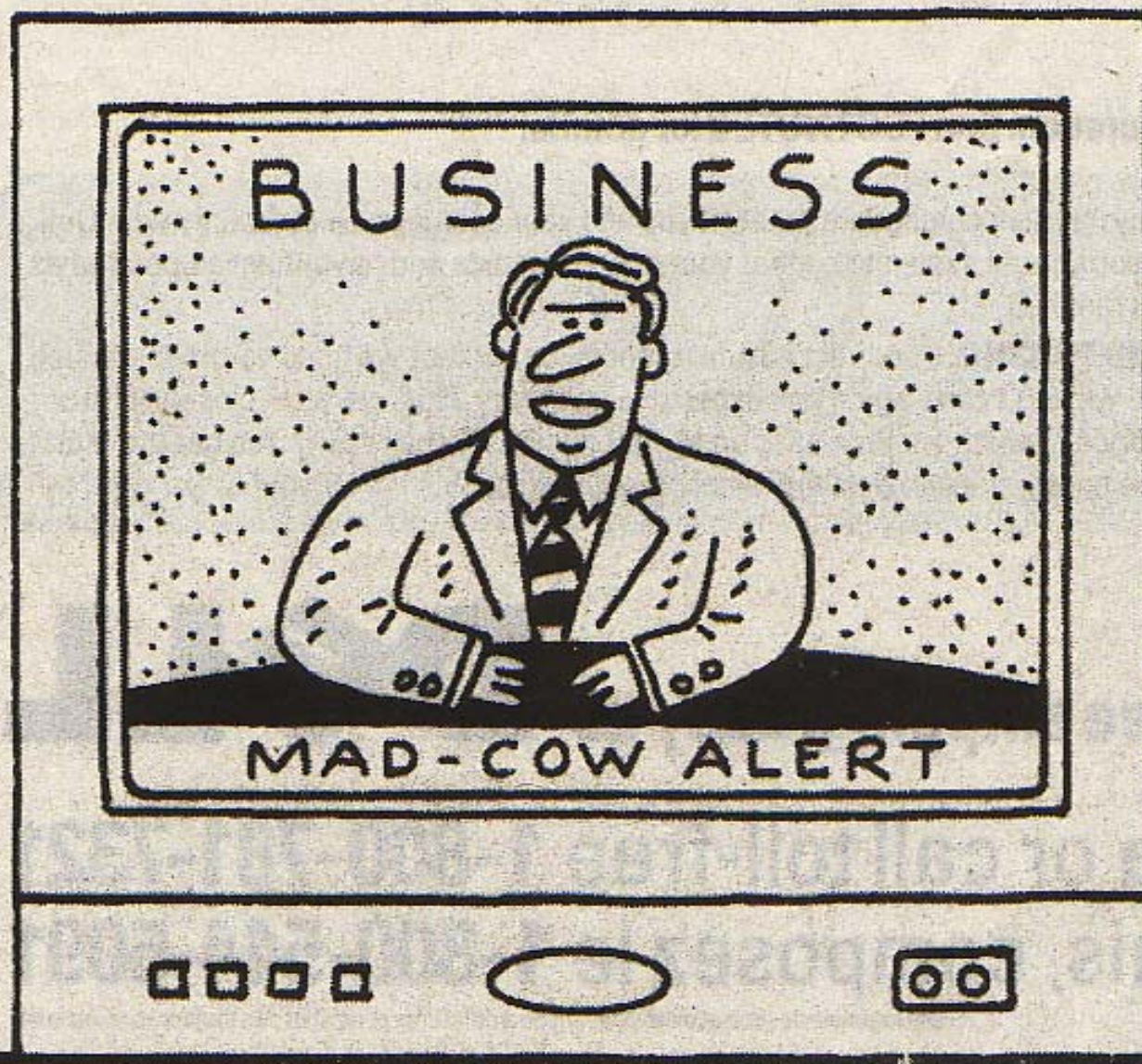
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Karen Huff and Karl Meilke  
University of Guelph

Calum Turvey  
Rutgers University

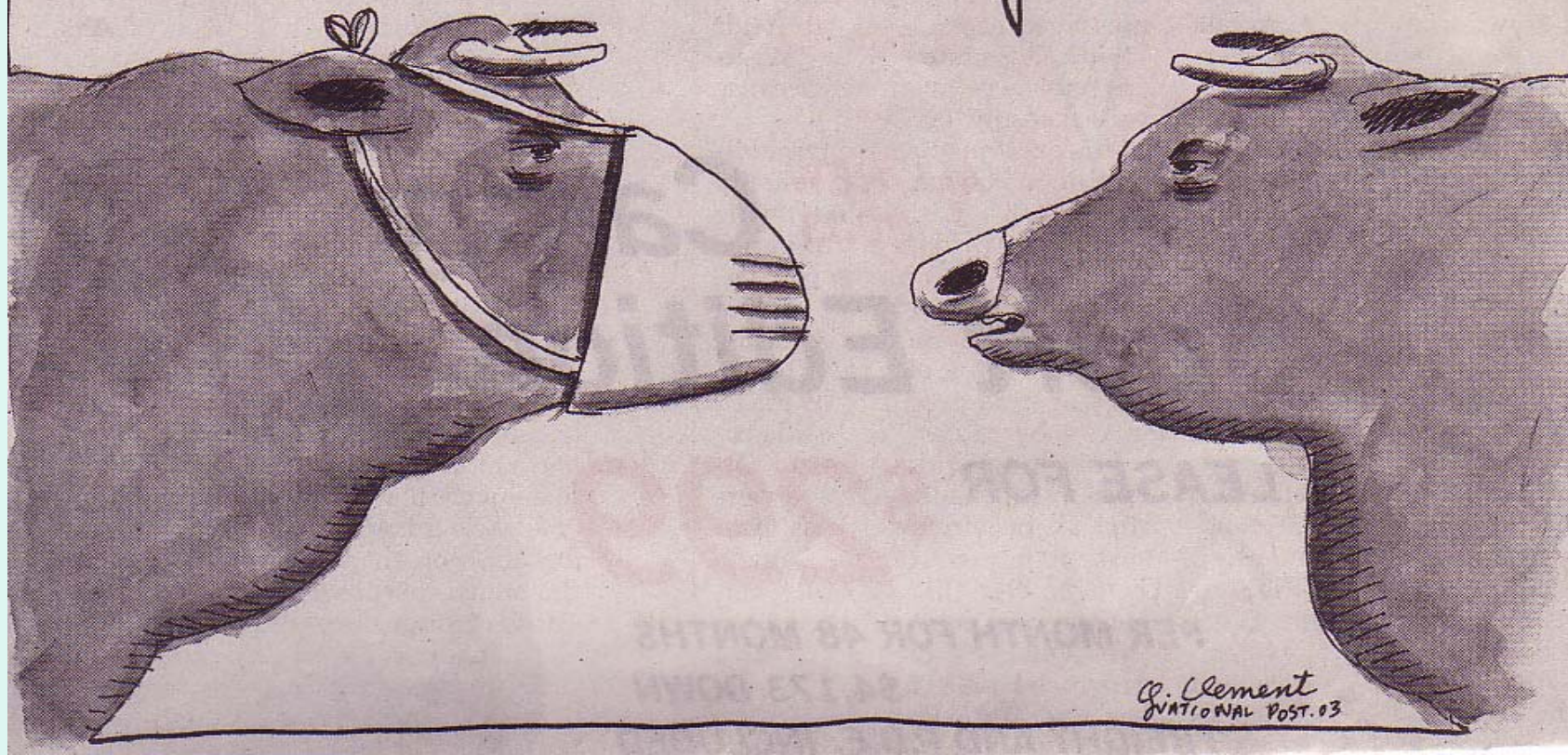
WCC-72, Las Vegas

June 9, 2003



'In futures trading today, it was a bear market for bulls.'

That won't  
help.



# Key Issues

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- Canada and Mexico Joined the NAFTA to Obtain Preferred (tariff free) and More Secure Access to the United States Market
  - How Can This Access be Maintained – While Meeting Legitimate Security Concerns?
  - How Real is the Bioterrorism Threat?
  - What Would be the Economic Effects of a Bioterrorism Attack?

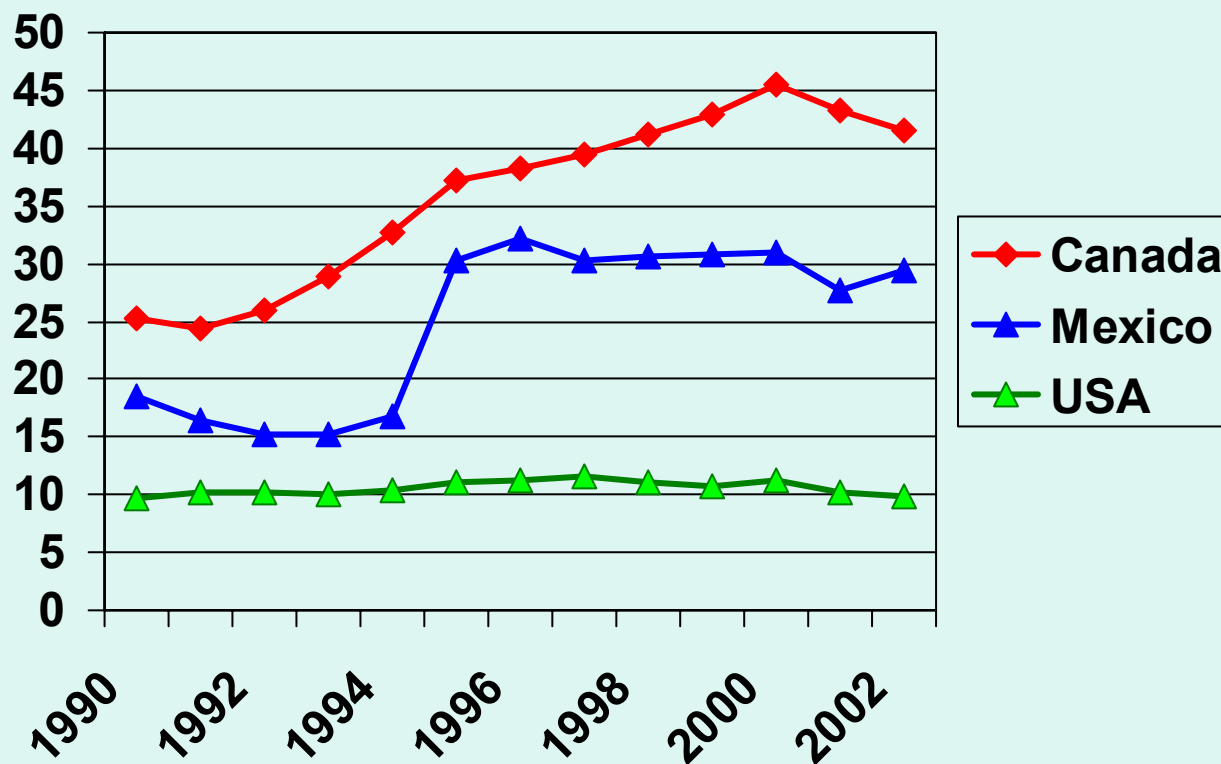
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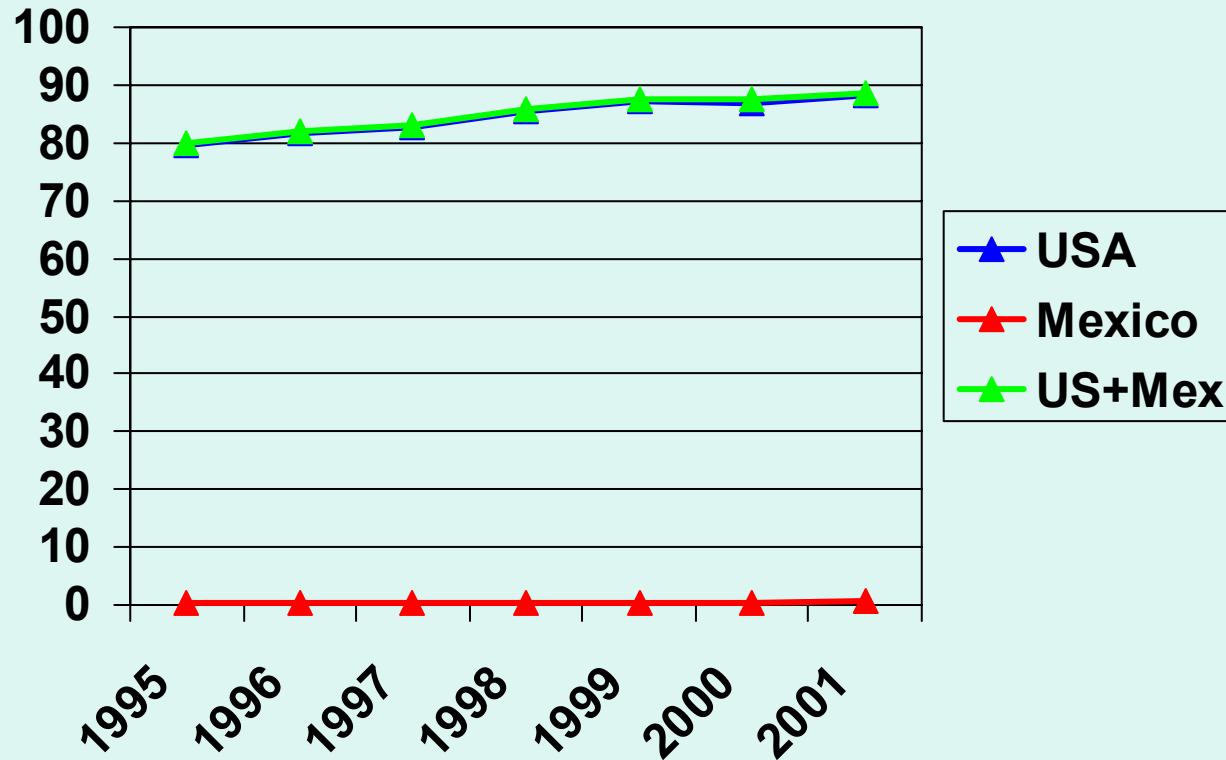
# Fraction of GDP Exported, 1990-2002

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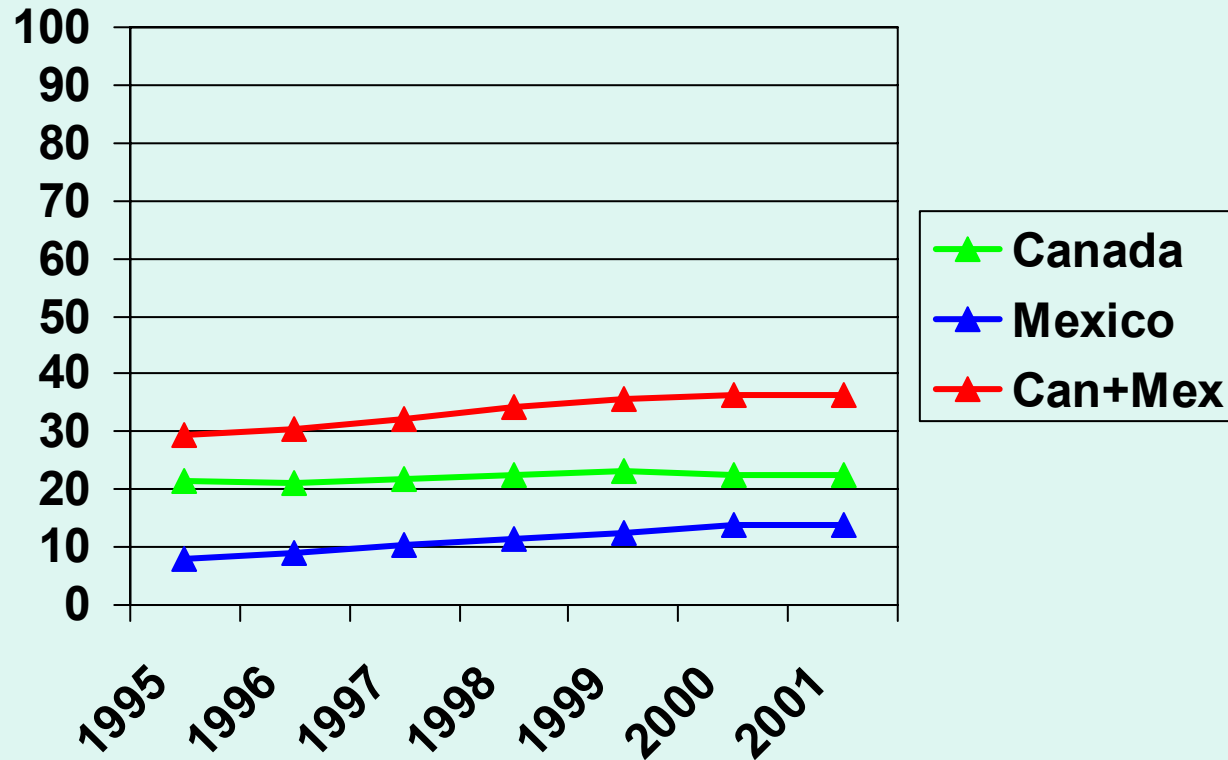
# Fraction of Canadian Exports to US and Mexico, 1995-2001

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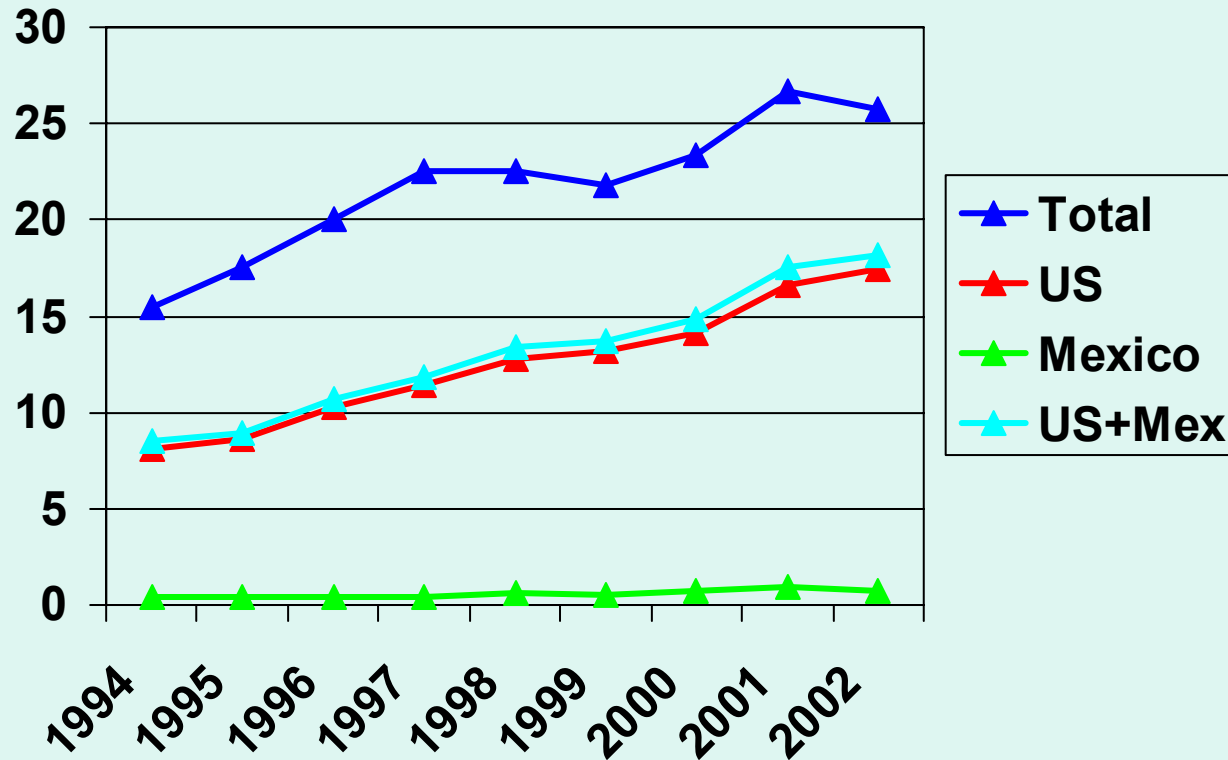
# Fraction of US Exports to Canada and Mexico, 1995-2001

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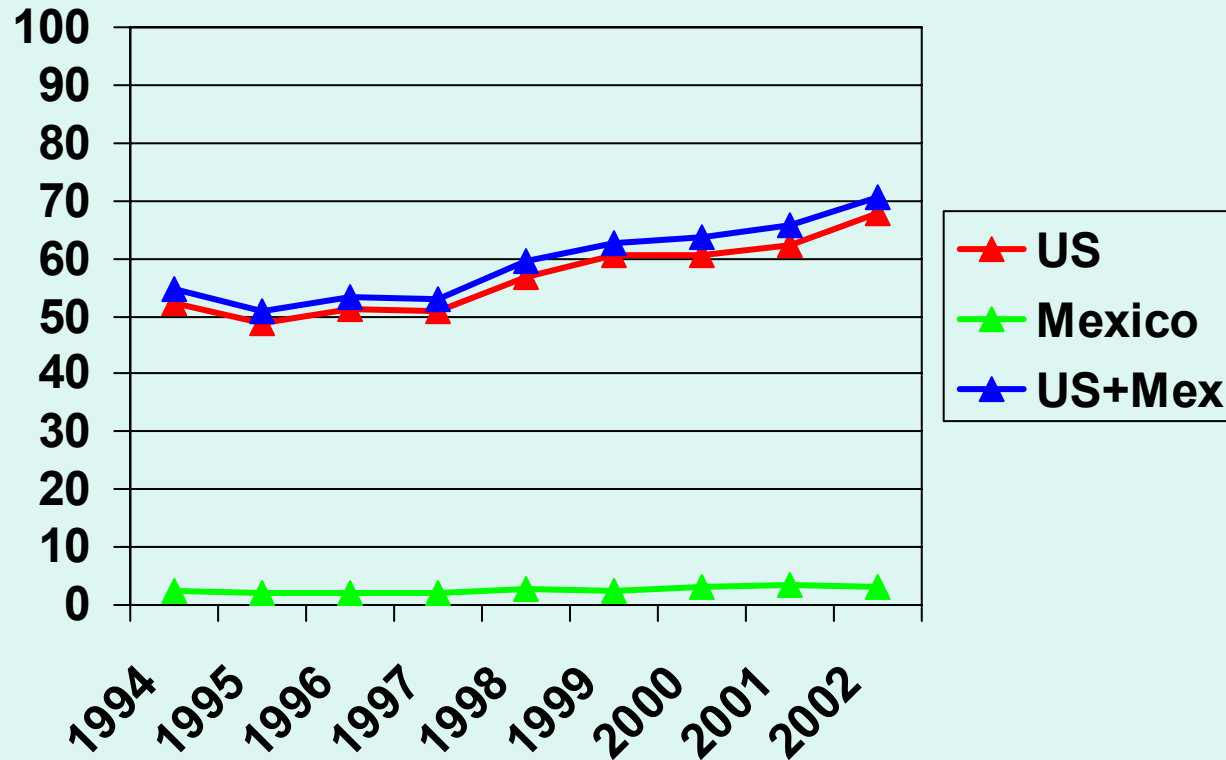
# Canada's Agri-Food Exports: Total, US, Mexico, 1994-2002, Bil. Can. Dol.

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# Fraction of Canada's Agri-Food Exports to the US and Mexico.

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# From Where Would an Attack Originate?

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- United States
- NAFTA Partner Country
- Other Country

# Terrorism Targets

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- Humans
- Food
- Water
- Livestock
- Crops
- Infrastructure

# Product Flows

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- About 40% of Canada's Shipments to the US Move Via Rail
  - 60% of total at 4 border crossings
- Most of the Rest Via Truck
  - 60% of total at 4 border crossings – 55 % from 3 border crossings in Ontario alone

# Product Flows

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A Border Slow Down Changes

“Just in Time Delivery”

to

“Give Me Time Delivery”

# How Real is a Biosecurity Threat?

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- “The US livestock industry...is extremely vulnerable to a host of highly infectious and often contagious biological agents...APHIS...would probably be unable to help eradicate intentional introduction, especially if this were done at multiple sites.”

# Terrorism Targets

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- The Major Economic Impacts Would Come From Terrorist Attacks on Livestock and Crops
- In Taiwan a Naturally Occurring FMD Outbreak in Swine Only
  - 1/3 of herd destroyed
  - exports to zero
  - price declined 44%
  - revenue declined 64%

# Foot and Mouth Disease

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- “How To” List on APHIS Web Site
- Easy to Transport
- Highly Infectious
- Major Cost to Eradicate
- No Risk to Human Health

# FMD Control Measures

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- Protect Disease Free Zones Through Animal Movement Control
- Slaughter Infected, Recovered and Susceptible Animals
- Disinfect: Premises, Implements, Trucks, Cars, Clothes
- Destruction of Cadavers, Litter, and Animal Products in Infected Area
- Quarantine

# GTAP

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- Computable General Equilibrium Model
- Captures Economy Wide Effects
  - Perfect competition
  - Constant returns to scale, CES technology
  - Domestic and imported products are treated as differentiated goods via the Armington assumption
  - Welfare changes measured using equivalent variation
  - 11 Agricultural sectors
  - 9 Countries/regions

# Foot and Mouth Disease

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- Modeled Via Negative Productivity Shocks in Primary Production (Cattle, Swine, Milk)
  - Labor
  - Capital
- Immobile
  - Land
- Intermediate Inputs (feed) Released

# Scenarios – FMD in US Only

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- Scenario 1A
  - 5 % reduction in Output of Cattle, Milk and Swine
- Scenario 1B
  - 10 % reduction in Output of Cattle, Milk and Swine
- Scenario 1C
  - 20 % reduction in Output of Cattle, Milk and Swine
- Borders Remain Open!!!!

# Scenarios – FMD in US Only

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- Scenario 2
  - 10 % reduction in Output of Cattle, Milk and Swine
  - A ban on US Exports of Livestock, Swine, Meat and Dairy Products to FMD-Free Countries

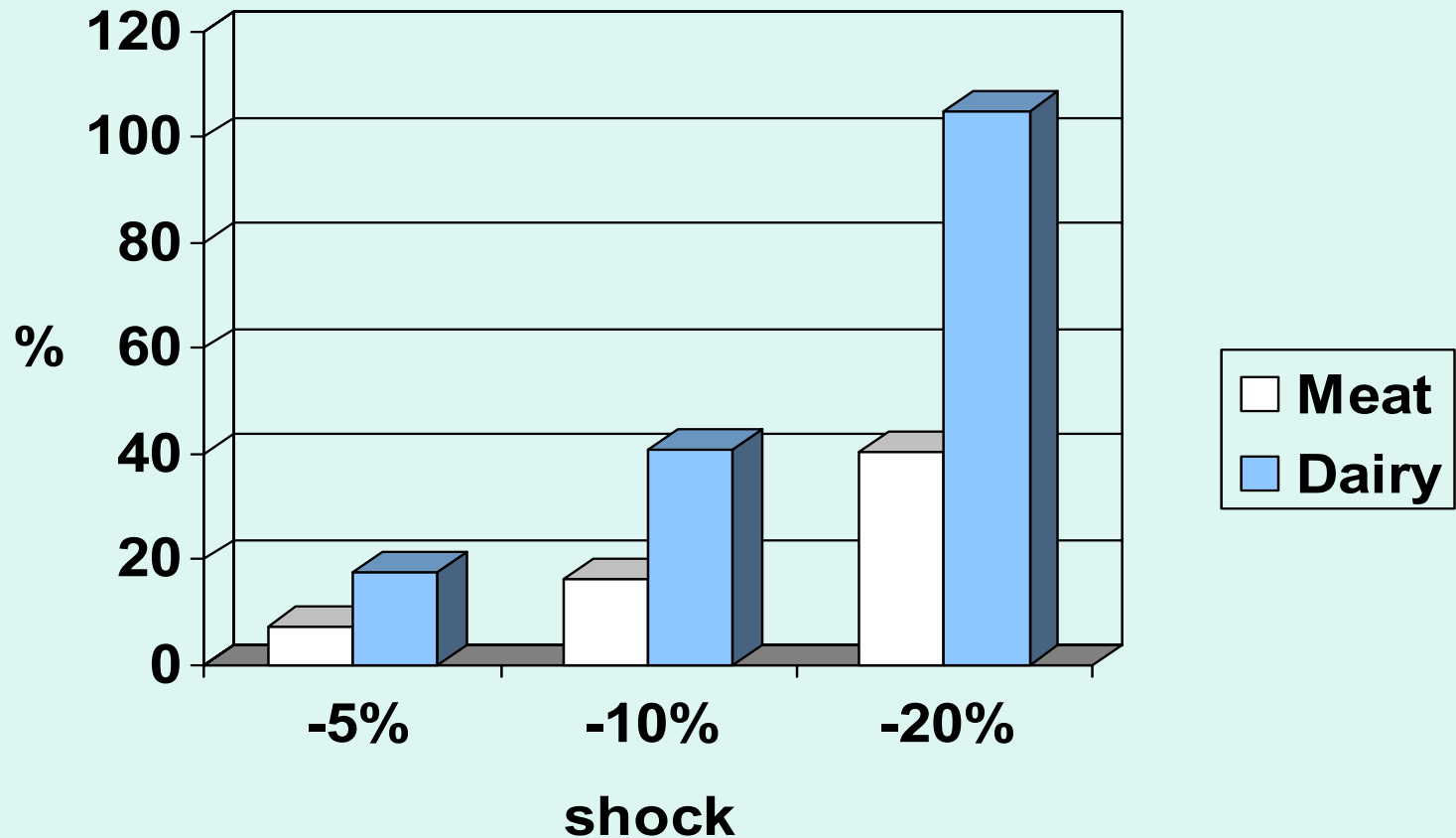
# Scenarios – FMD in US Only

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- Scenario 3
  - 10 % reduction in Output of Cattle, Milk and Swine
  - A Ban on US Exports of Livestock, Swine, Meat and Dairy Products to FMD-Free Countries
  - Shift in US Domestic Demand Away from Domestic Products and Towards Foreign Products

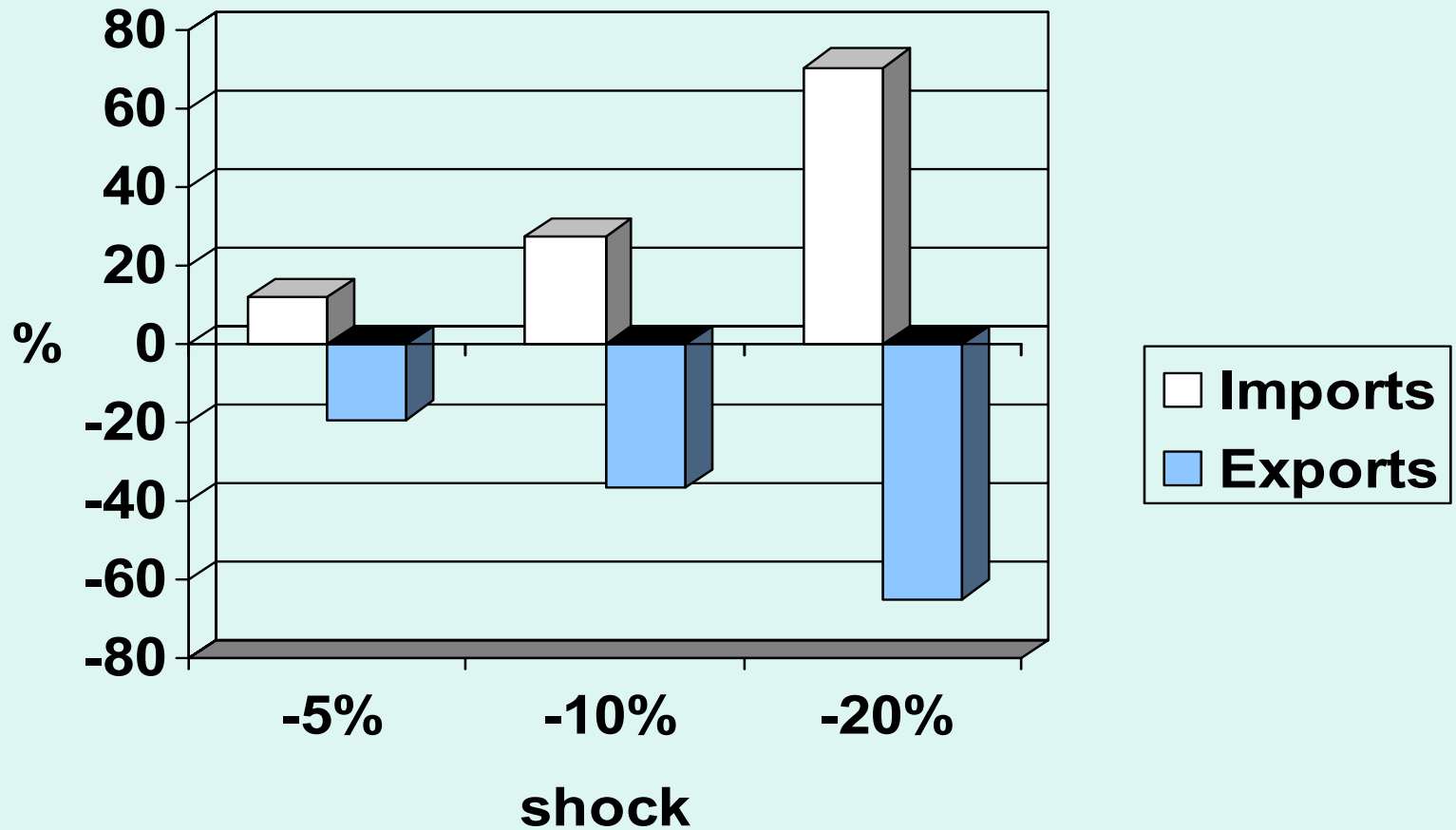
# Meat and Dairy Price Effects, US

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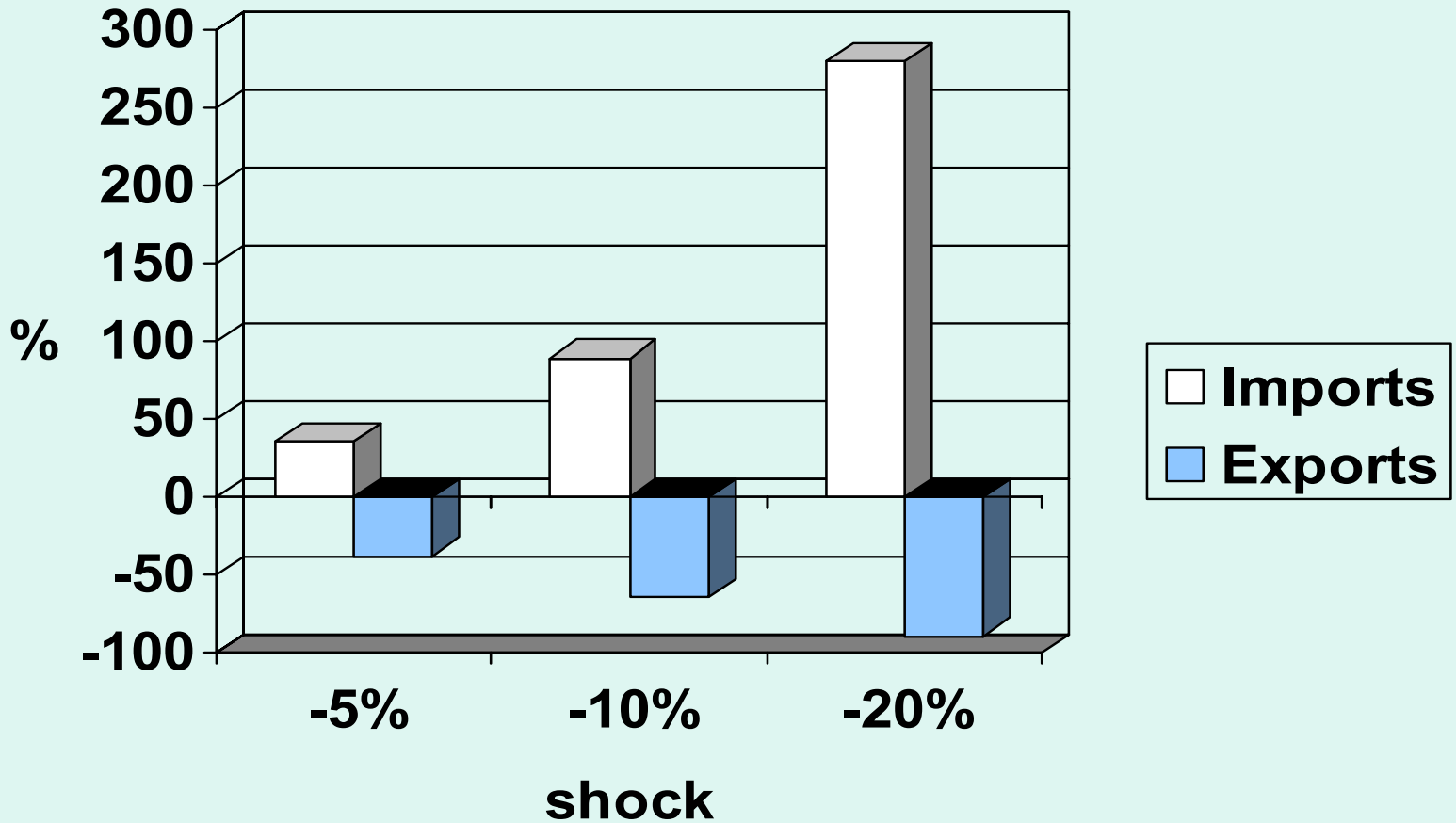
# Meat Trade, US

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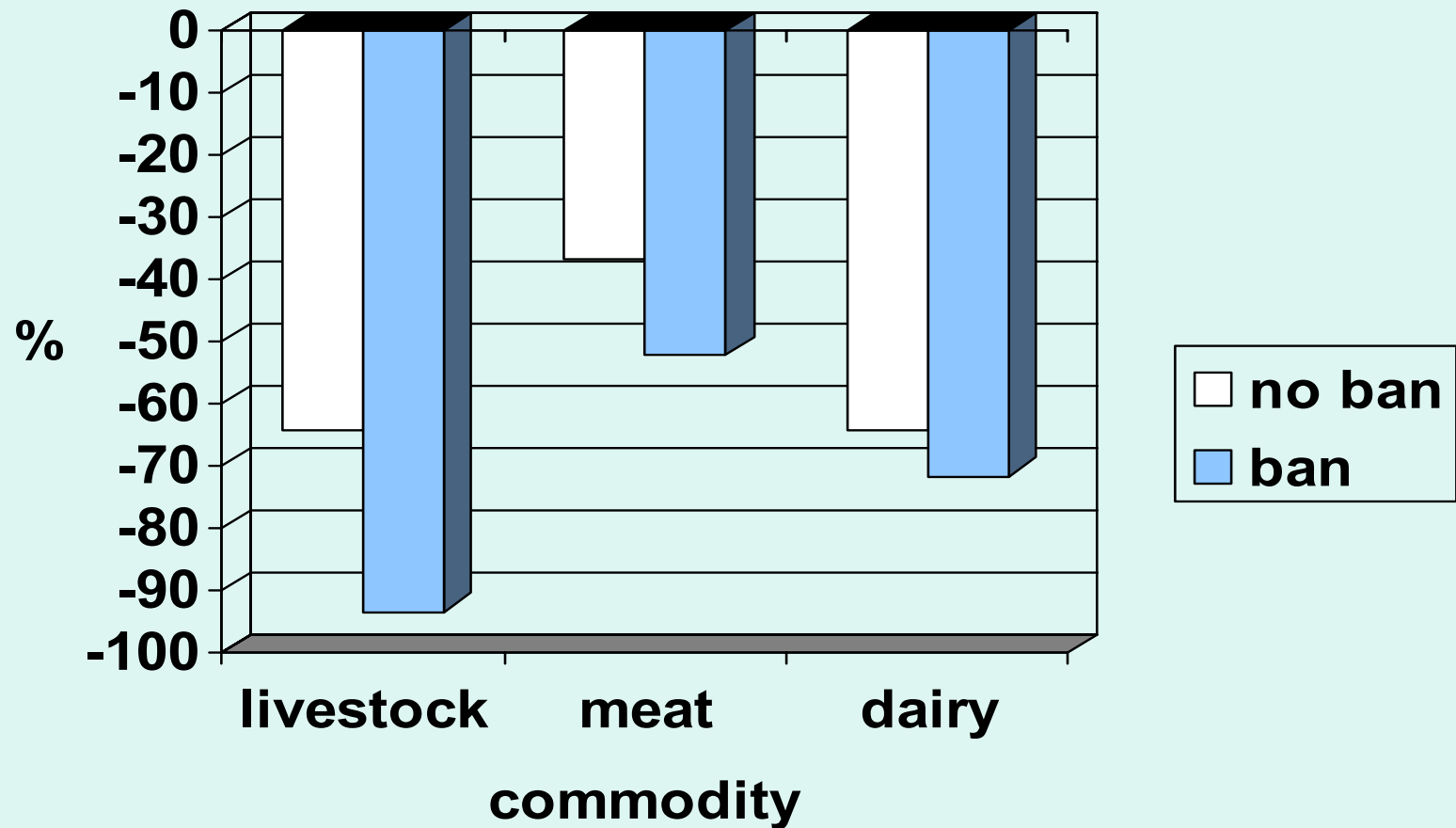
# Dairy Trade, US

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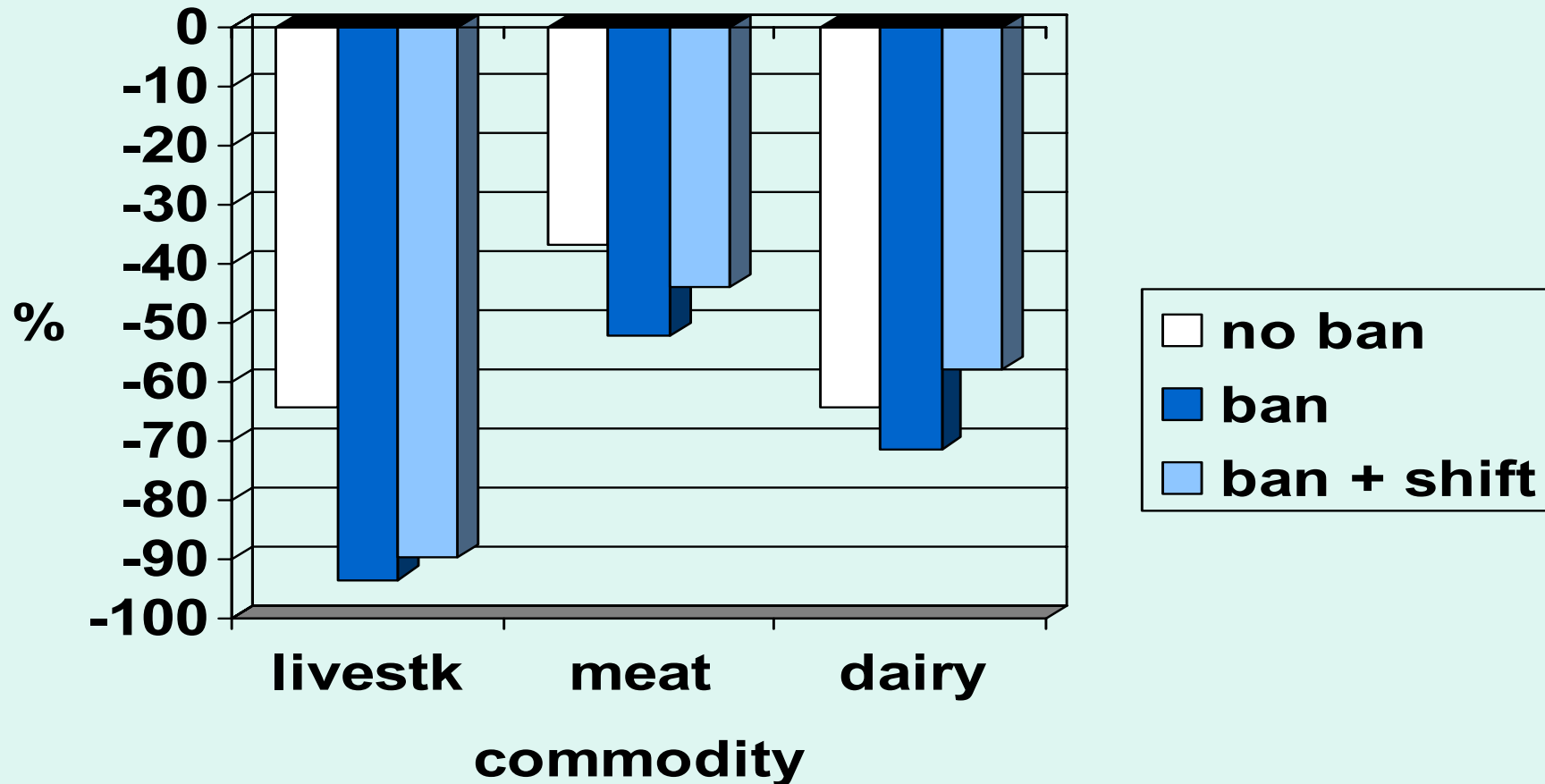
# Effect of Adding a Ban on US Exports for -10% Output Shock

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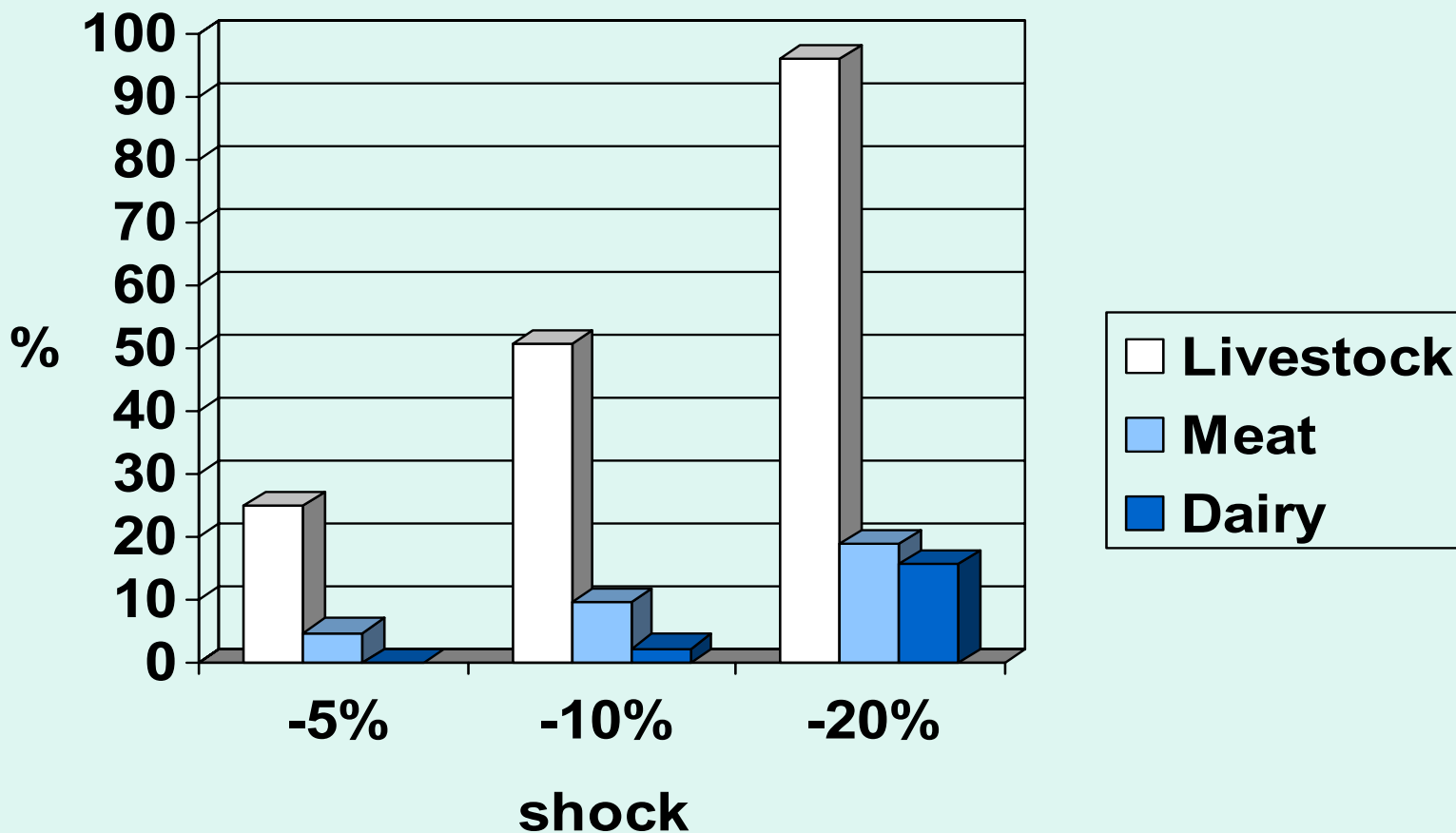
# Effect of Adding a Ban and a Demand Shift on US Exports 10% Output Shock

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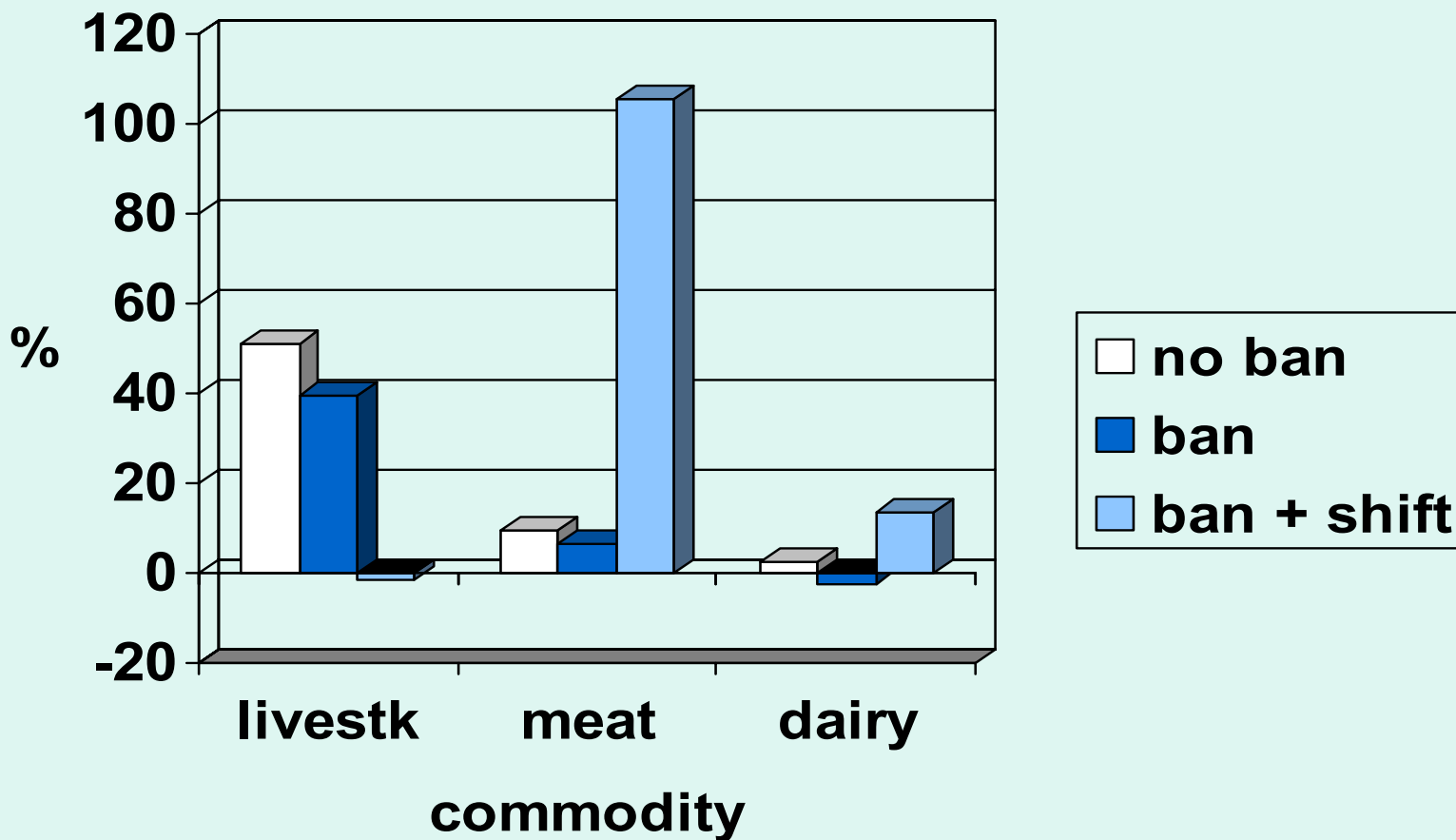
# Canada's Exports – No Ban or Demand Shift

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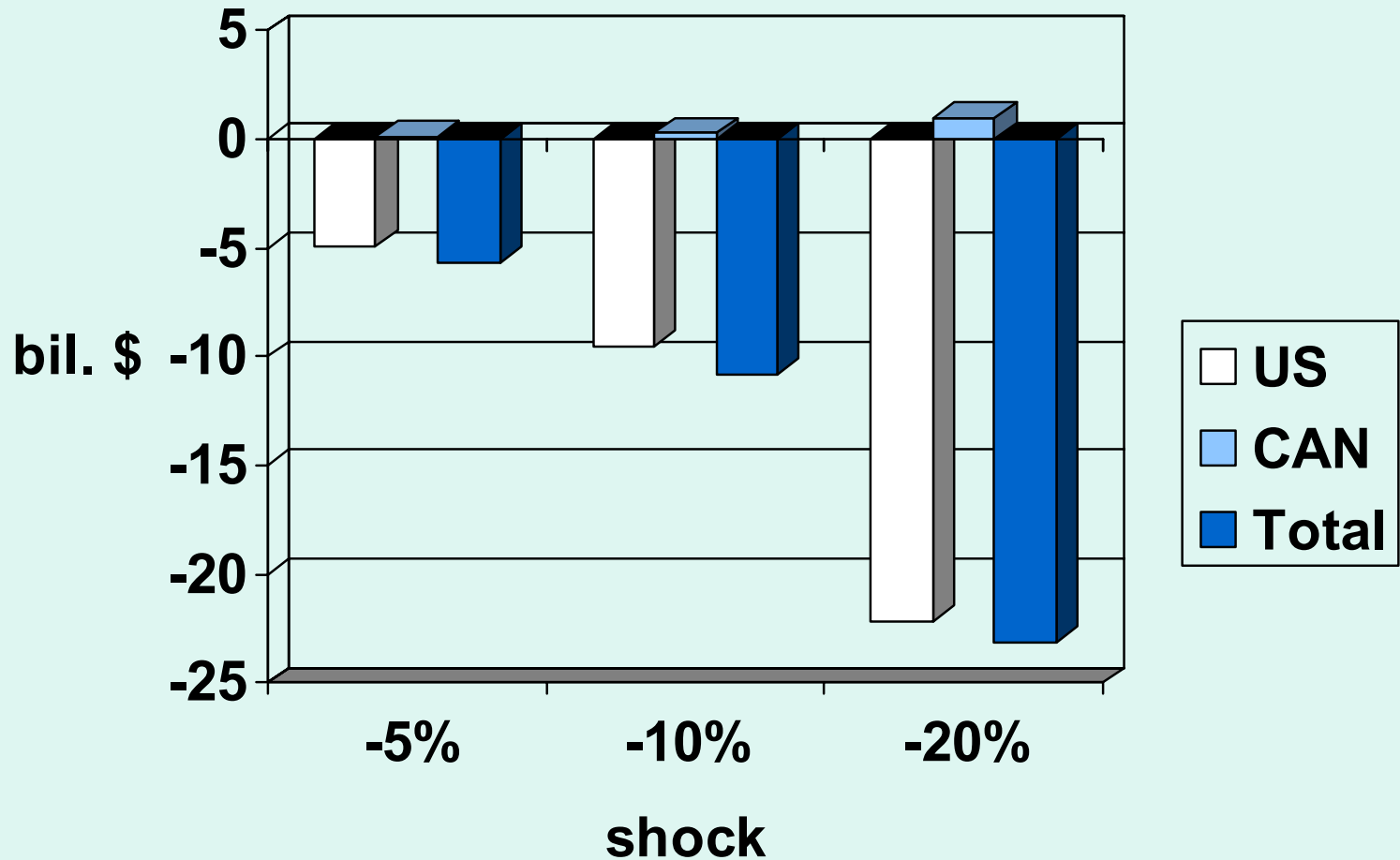


# Effect of a Ban and a Demand Shift on Canada's Exports - 10% Output Shock

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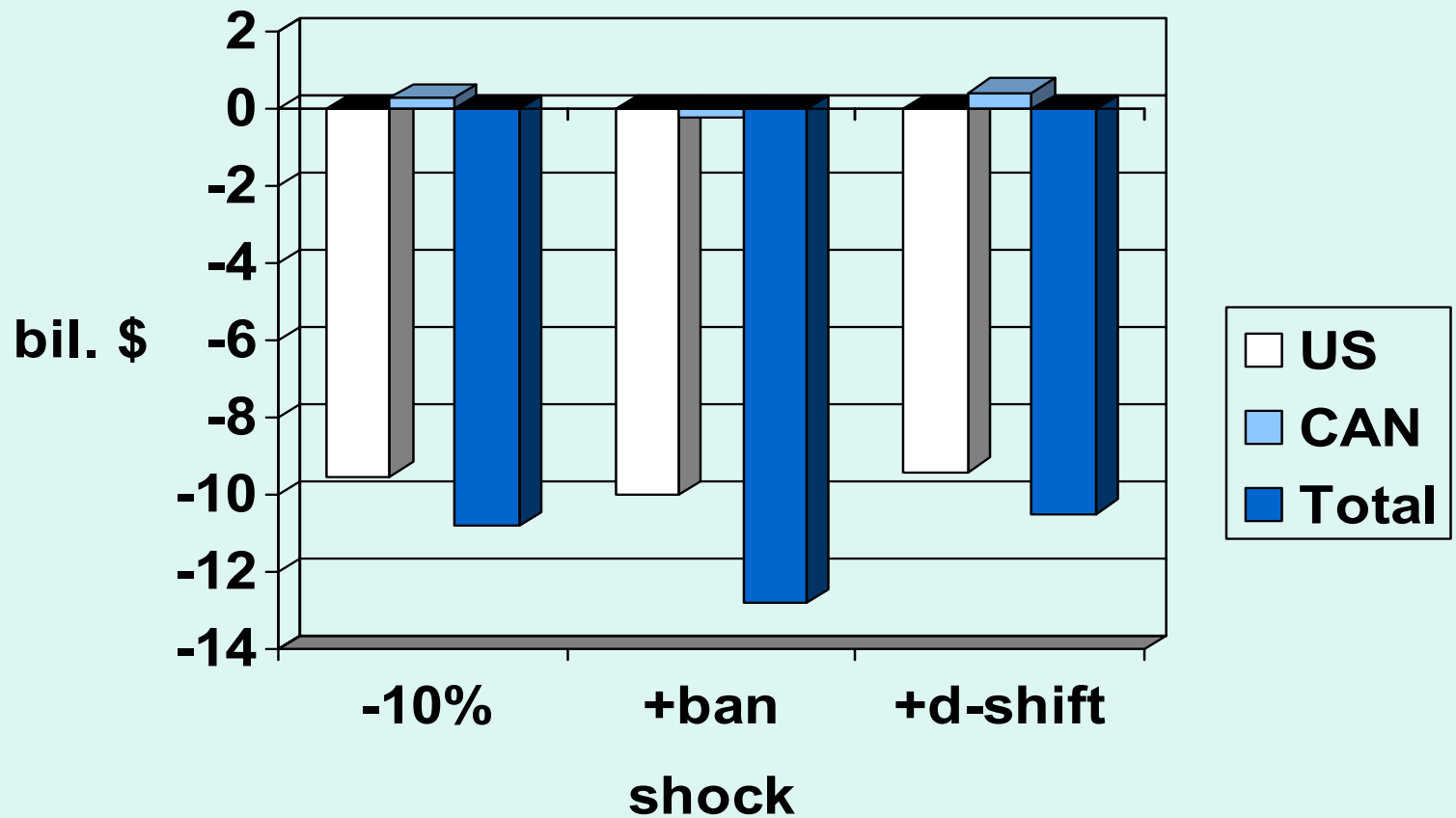


# Welfare Effects



# Welfare Effects

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# Problems

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- Cost of Control, Compensation and Eradication Neglected
- Short-Run Effects
- Small Price Increase for Swine

# Thanks And Let's Hope There Is Never an Attack!!!

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