

# The Future of Terrorism Risk Insurance in the US: Looking Beyond TRIA

**Howard Kunreuther** ([kunreuther@wharton.upenn.edu](mailto:kunreuther@wharton.upenn.edu))  
**Erwann Michel-Kerjan** ([erwannmk@wharton.upenn.edu](mailto:erwannmk@wharton.upenn.edu))  
Center for Risk Management and Decision Processes  
The Wharton School  
University of Pennsylvania

**CREATE Symposium**

**University of Southern California**  
**August 19, 2005**

# Key Questions Addressed by Wharton Risk Center study on *TRIA and Beyond*

How does terrorism insurance fit into homeland security policy?

How does one determine insurability of a risk?

What is an appropriate framework for determining supply and demand for terrorism protection?

What are impediments to free market for terrorism risk management?

Does Terrorism Risk Insurance Act (TRIA) address these problems?

Who bears the loss from terrorism attack under TRIA?

What are alternative long-term options for terrorism insurance and what future research needs to be addressed?

# Nature of Terrorism Insurance Pre and Post 9/11

## **Prior to September 11, 2001**

Terrorism coverage in the United States was included in standard commercial insurance policy packages as an unnamed peril

## **Terrorist attacks of September 11, 2001**

The most costly event in the history of insurance

Insured damage currently estimated at \$35 billion covered by 150 insurers and reinsurers worldwide

Reinsurers responsible for 2/3 of the \$35 billion in claims

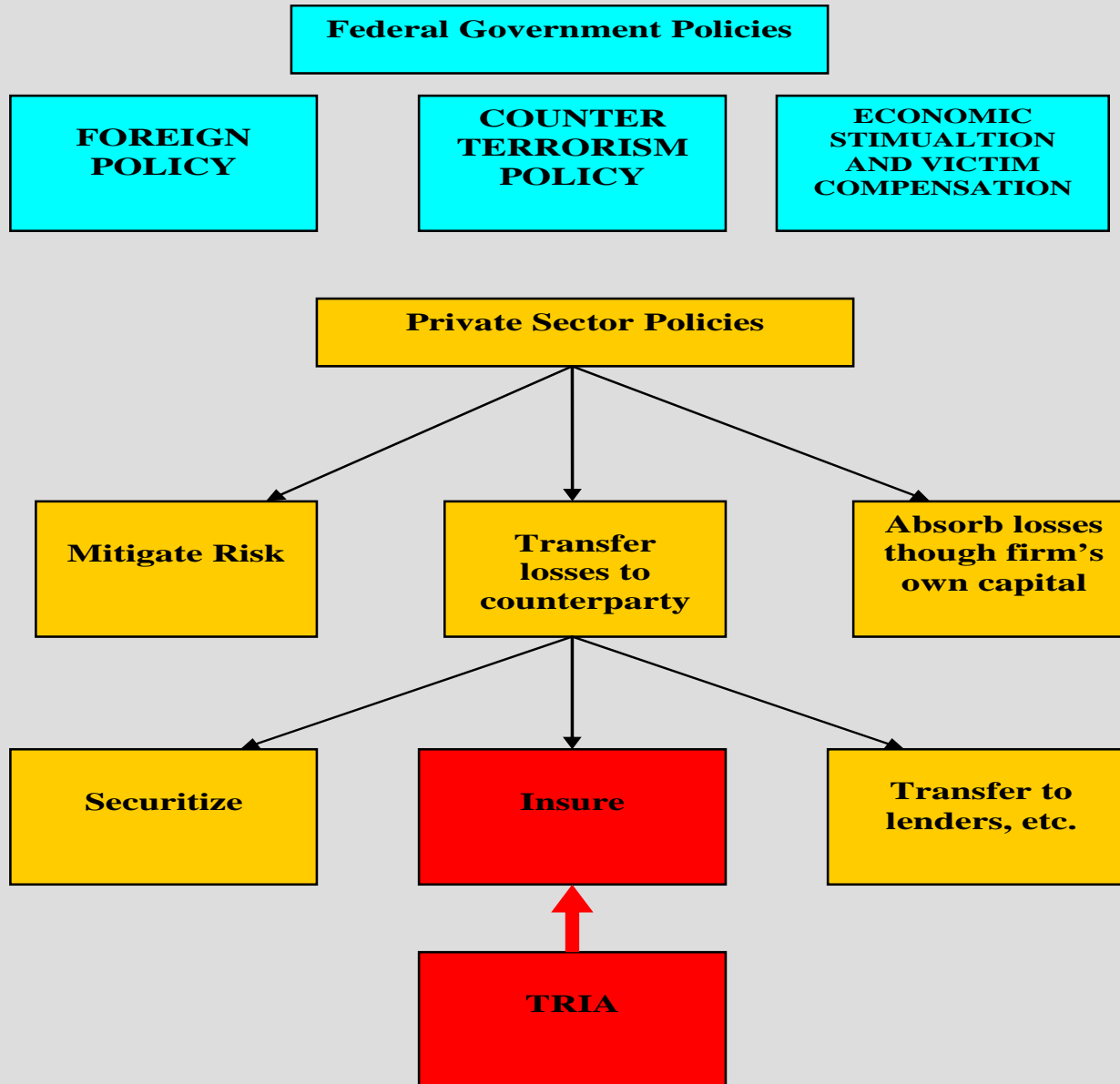
Most reinsurers stopped providing coverage in U.S. or raised premiums drastically

## **By 2002**

45 states in the U.S. permitted insurance companies to exclude terrorism from their policies (except WC)

Terrorism Risk Insurance Act (TRIA) passed by Congress in Nov. 2002

# Strategies and Policies to Deal with Terrorism Risk



# Nature of Insurability of Risks

## Conditions for Providing Coverage

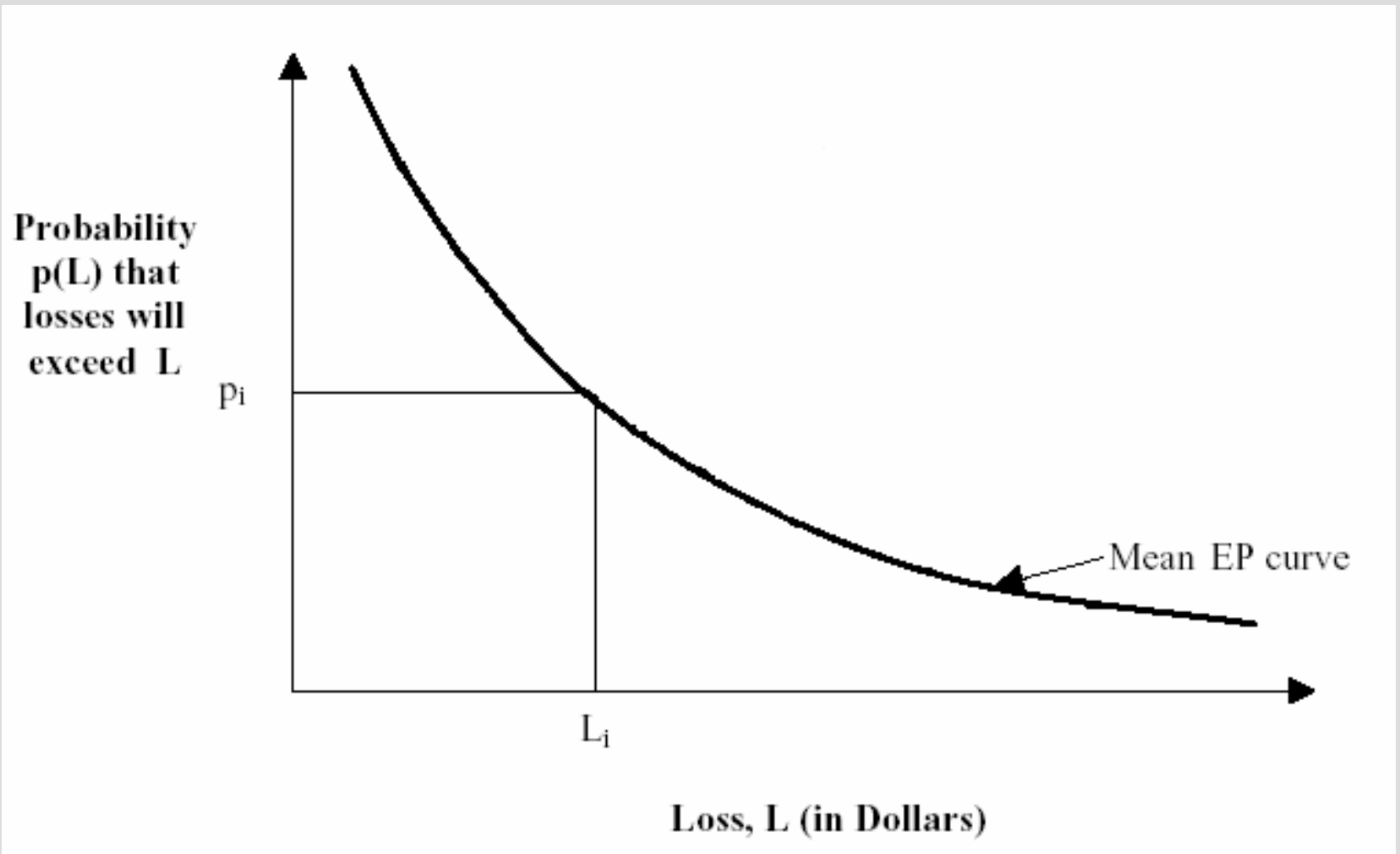
- Ability to identify and quantify risk
- Use of past data and scientific estimates

## Role of Catastrophe Models

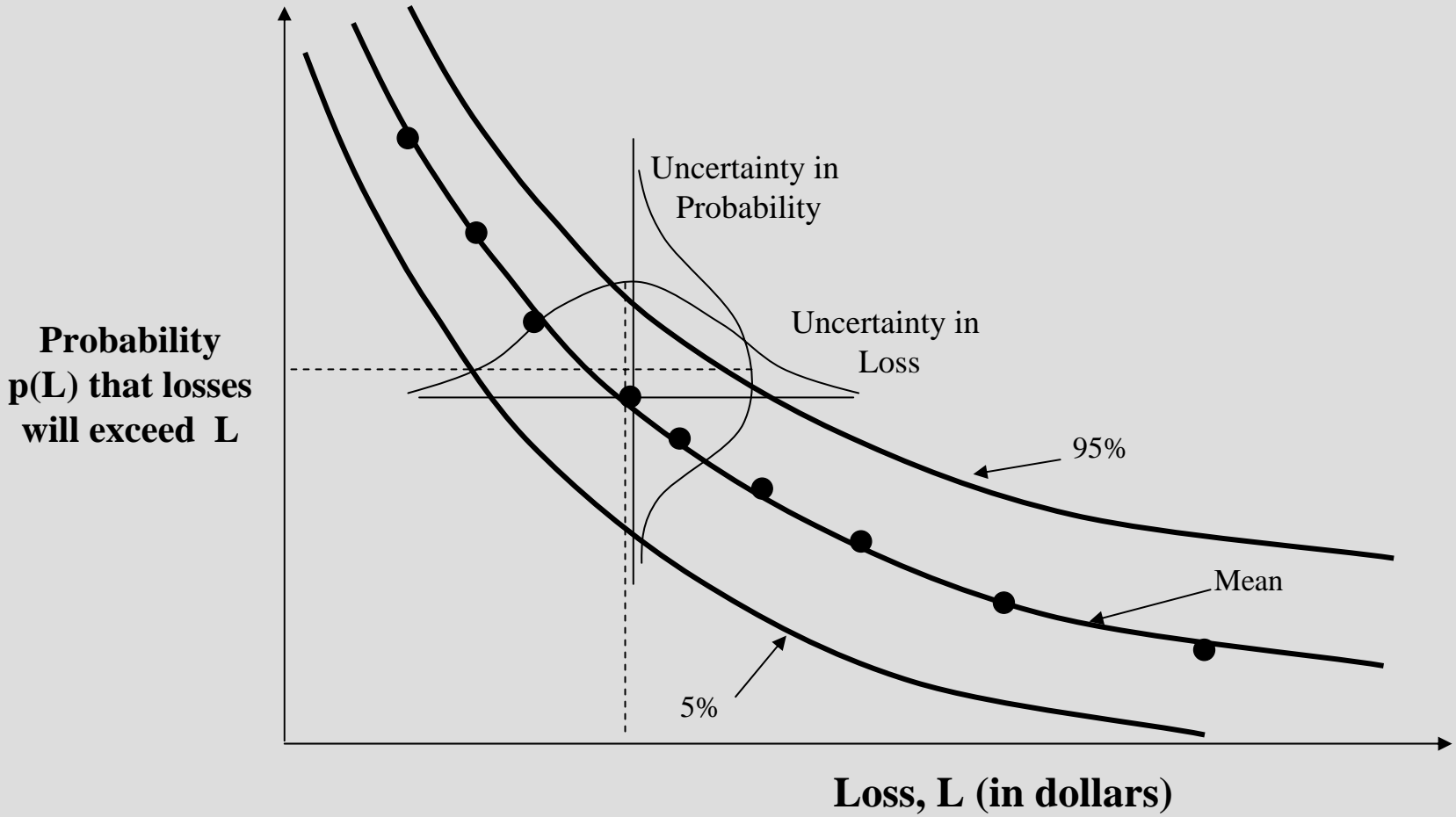
- Coordinates data on probability and outcomes
- Enables one to construct exceedance probability curves

## Importance of Survival Constraint

- Probability [Claims Payments ( $L^*$ ) > (Premiums + Assets)] <  $p_1$
- Determines number of policies firm is willing to write



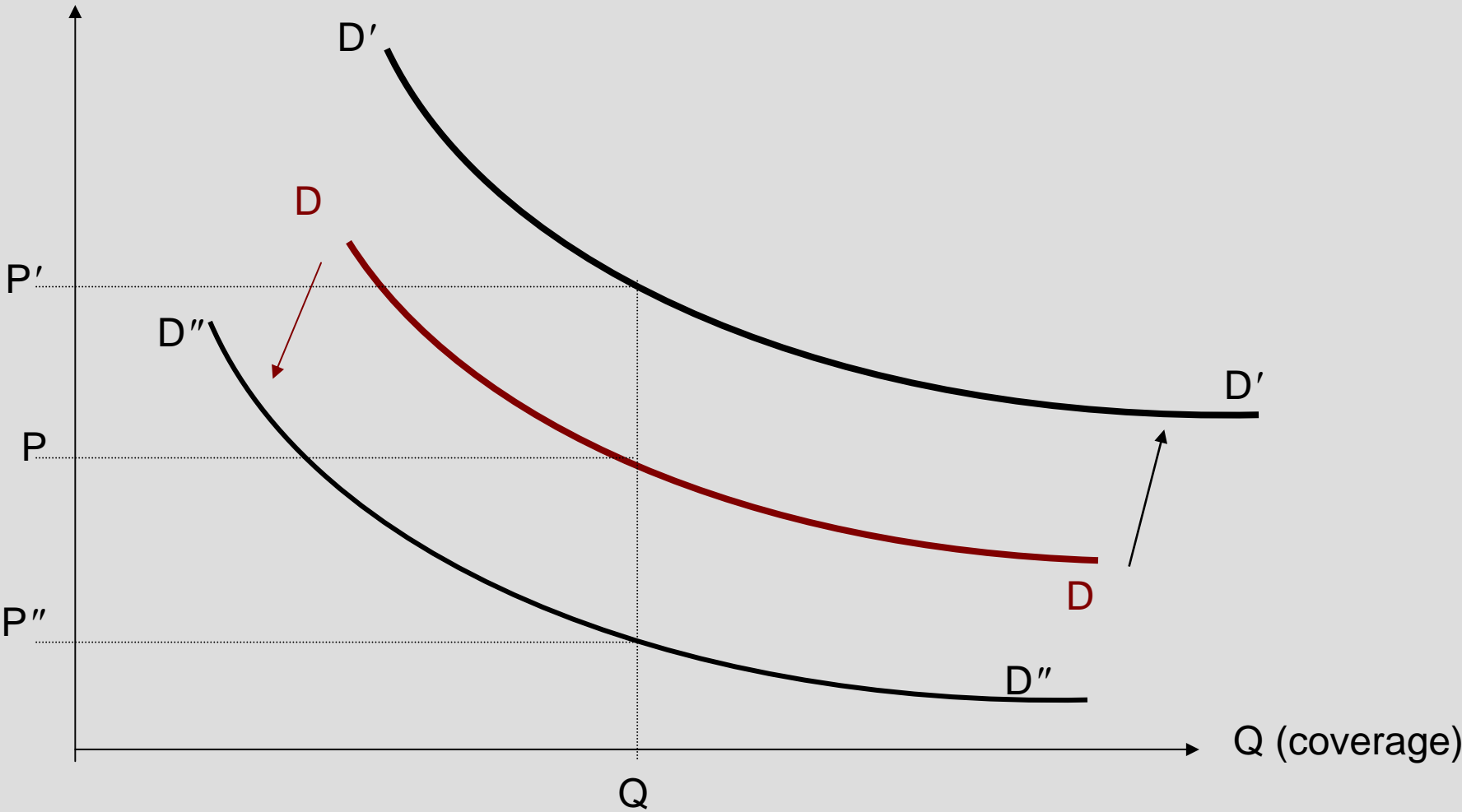
**Sample Mean Exceedance Probability Curve**



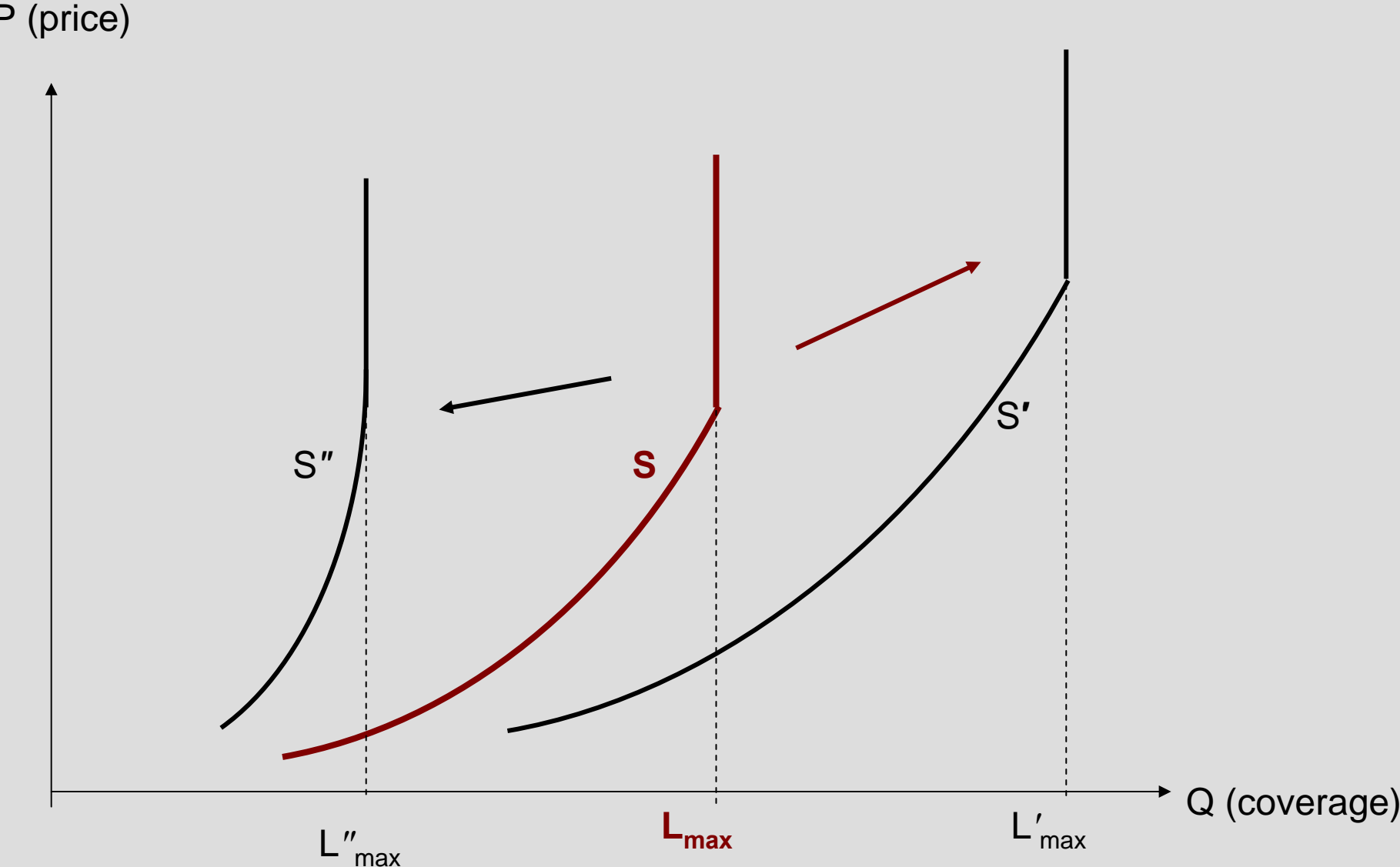
**Loss exceedance probability curves**

# Determining Ex Ante Demand by Commercial Firms

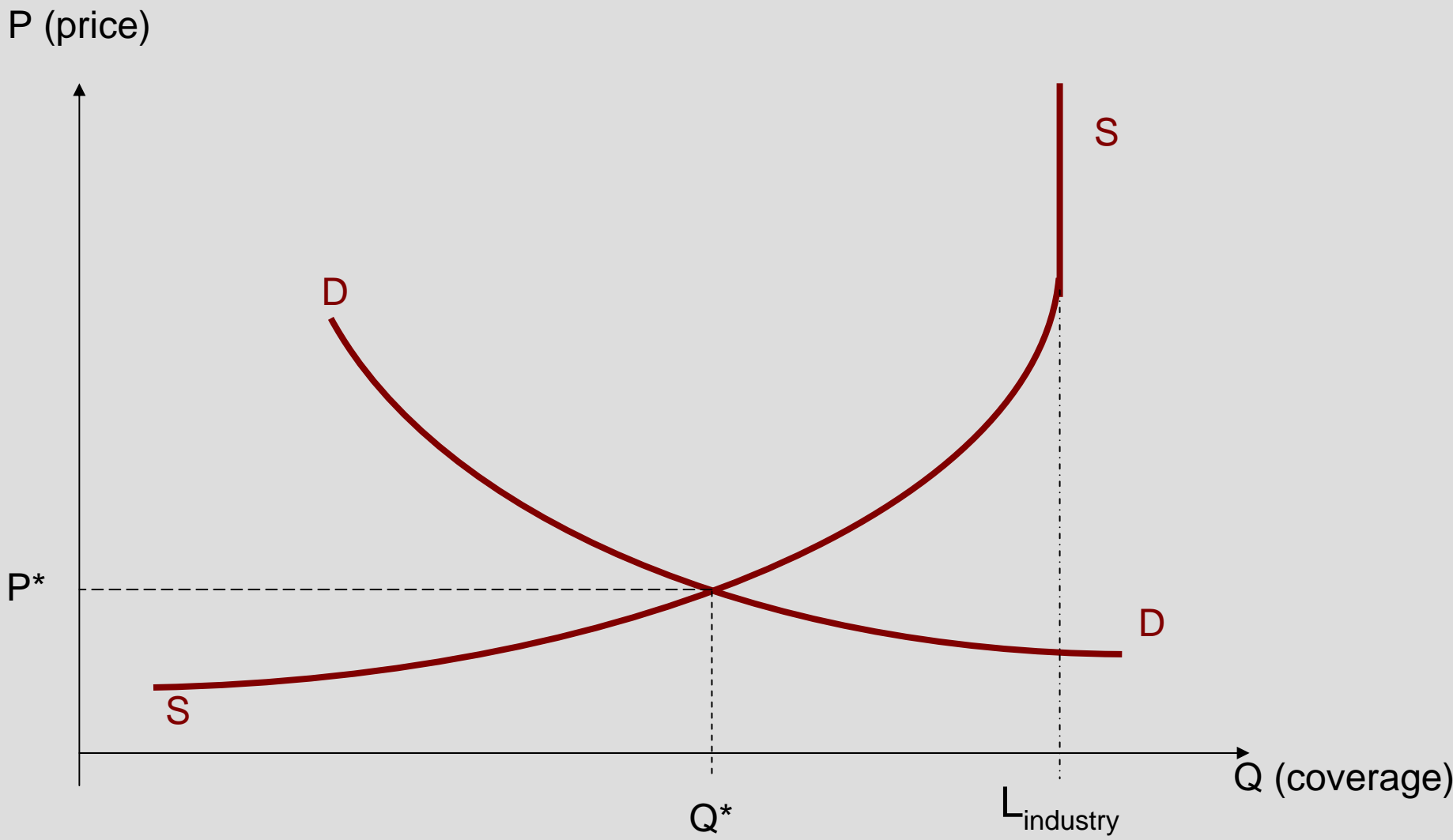
P (price)



# Determining Ex Ante Supply by Insurers



# Determining Ex Ante Price and Quantity of Insurance



# Is Terrorism Risk Insurable by the Private Sector Alone?

## **Challenges presented by terrorism risk today**

- Highly ambiguous risk
- Potential for extremely large losses
- Dynamic uncertainty
- Interdependency of risk
- Role of the government (national security, foreign policy)

## **State regulations requiring terrorism coverage with or without TRIA**

- Workers compensation
- Standard fire policy covers claims from terrorist attack

## **Insurers concern with their credit ratings (e.g. AM Best, Moody's, S&P)**

## **Limited capacity to cover large losses**

- Limited reinsurance
- Reluctance of capital markets to provide protection

**Federal tax policy significantly increases the costs to insurers and reinsurers of holding the large amounts of capital (surplus) necessary to insure terrorism**

# Special Features of TRIA

All insurers required to offer coverage to their commercial policyholders

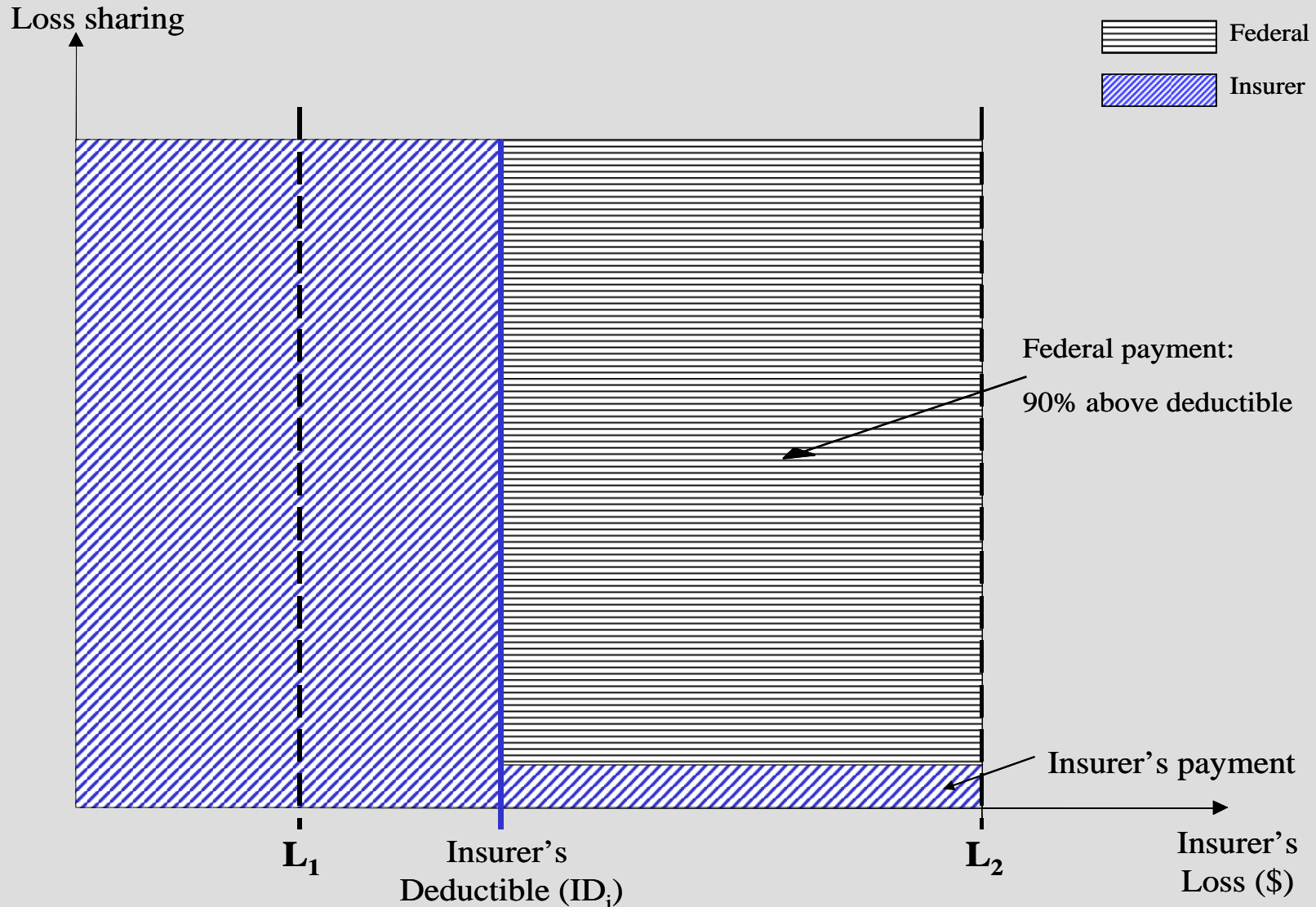
Policyholders have freedom to accept coverage

Free upfront government reinsurance, but government can partially recoup its payment ex post against all policyholders

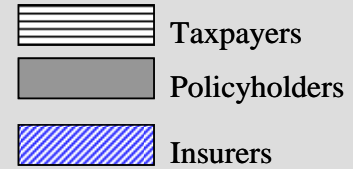
Specific risk-sharing arrangement between government and insurers for a certified event (i.e. losses from terrorism greater than \$5 million)

TRIA covered “certified events” only (no domestic terrorism)

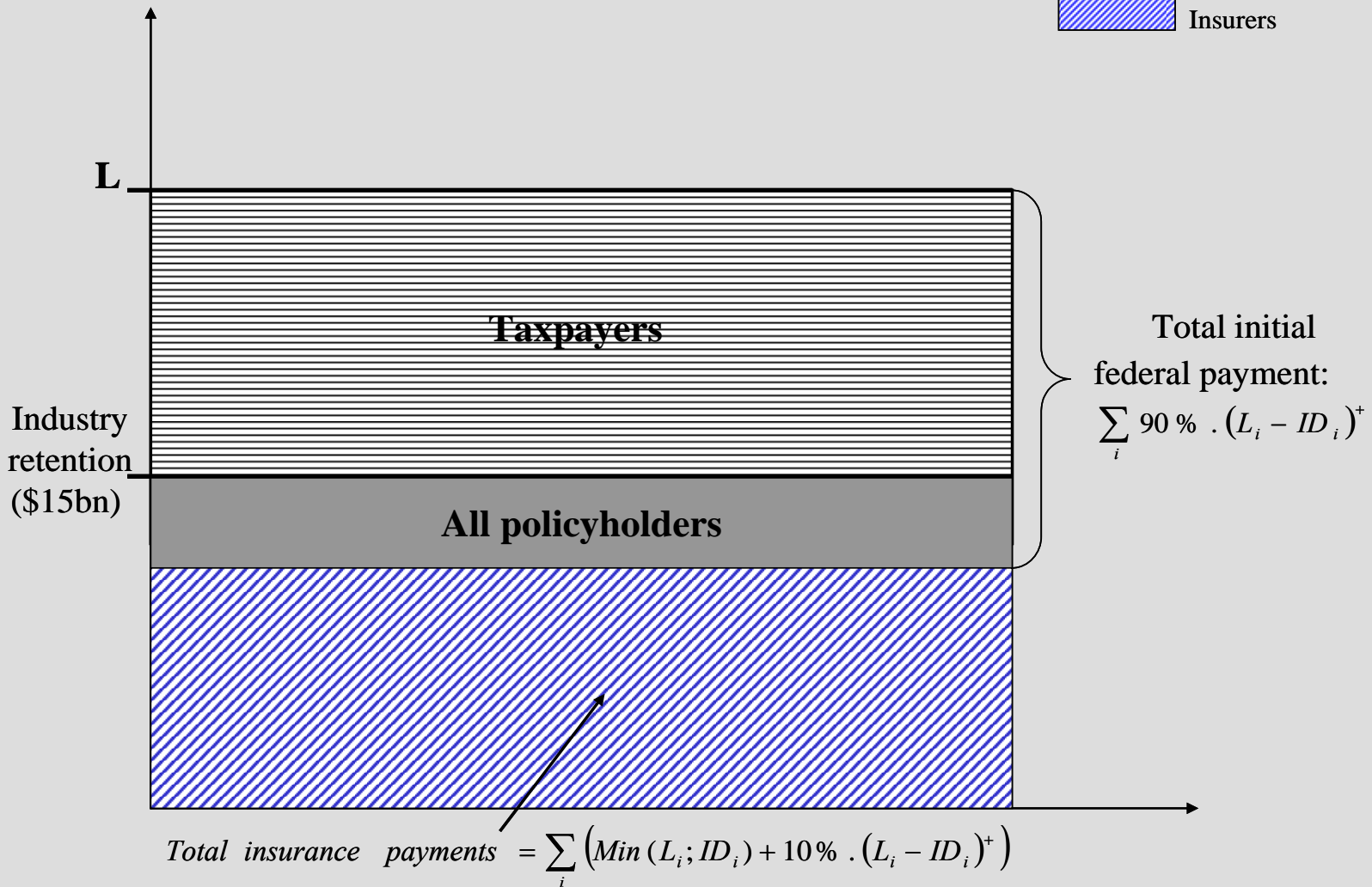
# Loss Sharing under TRIA Between An Insurer and Federal Government



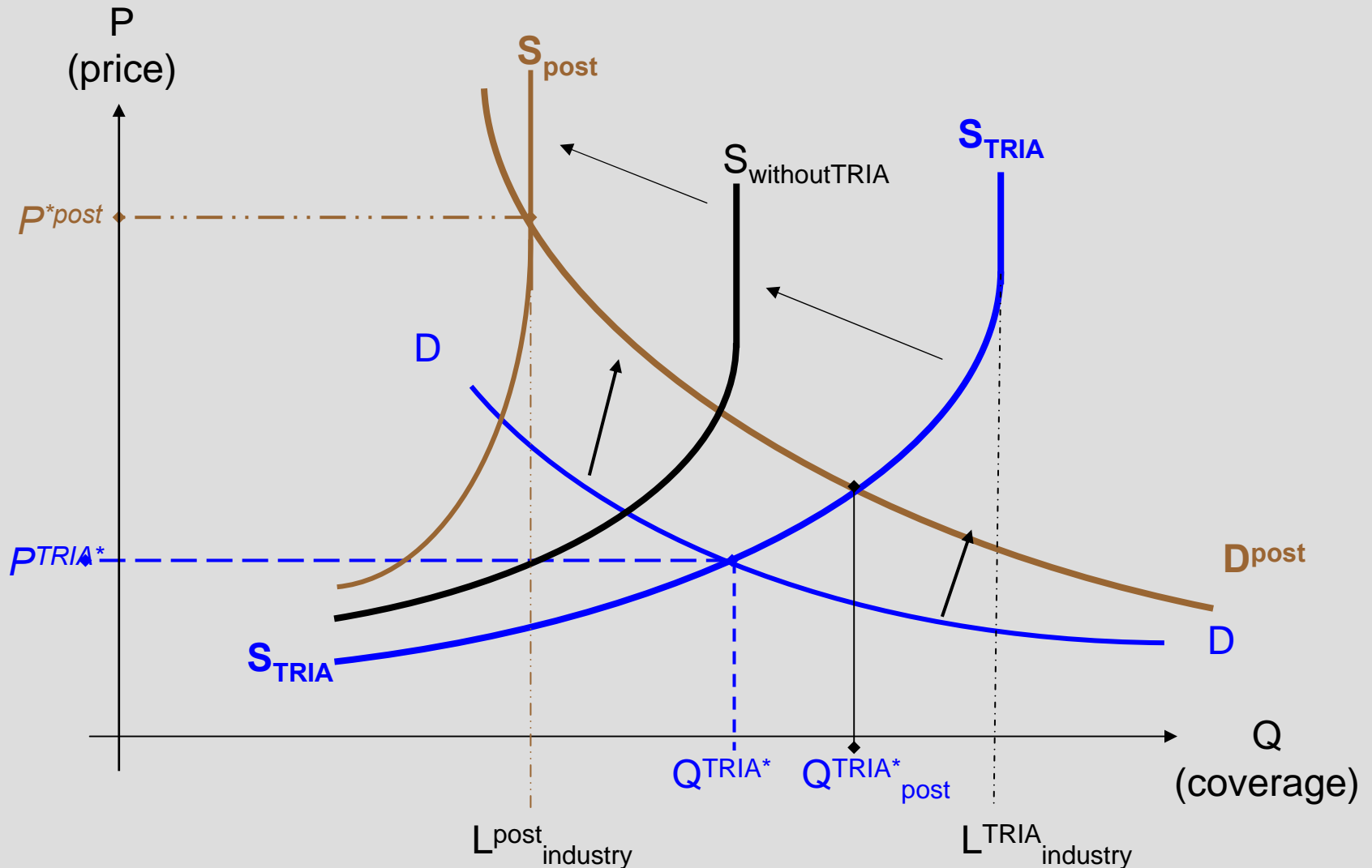
# Loss Sharing under TRIA between Insurance Industry, All Policyholders and Taxpayers (2005)



Total Insured Loss



# Market Reaction to a Terrorist Attack, with and without TRIA



# How do insurers determine their terrorism exposure?

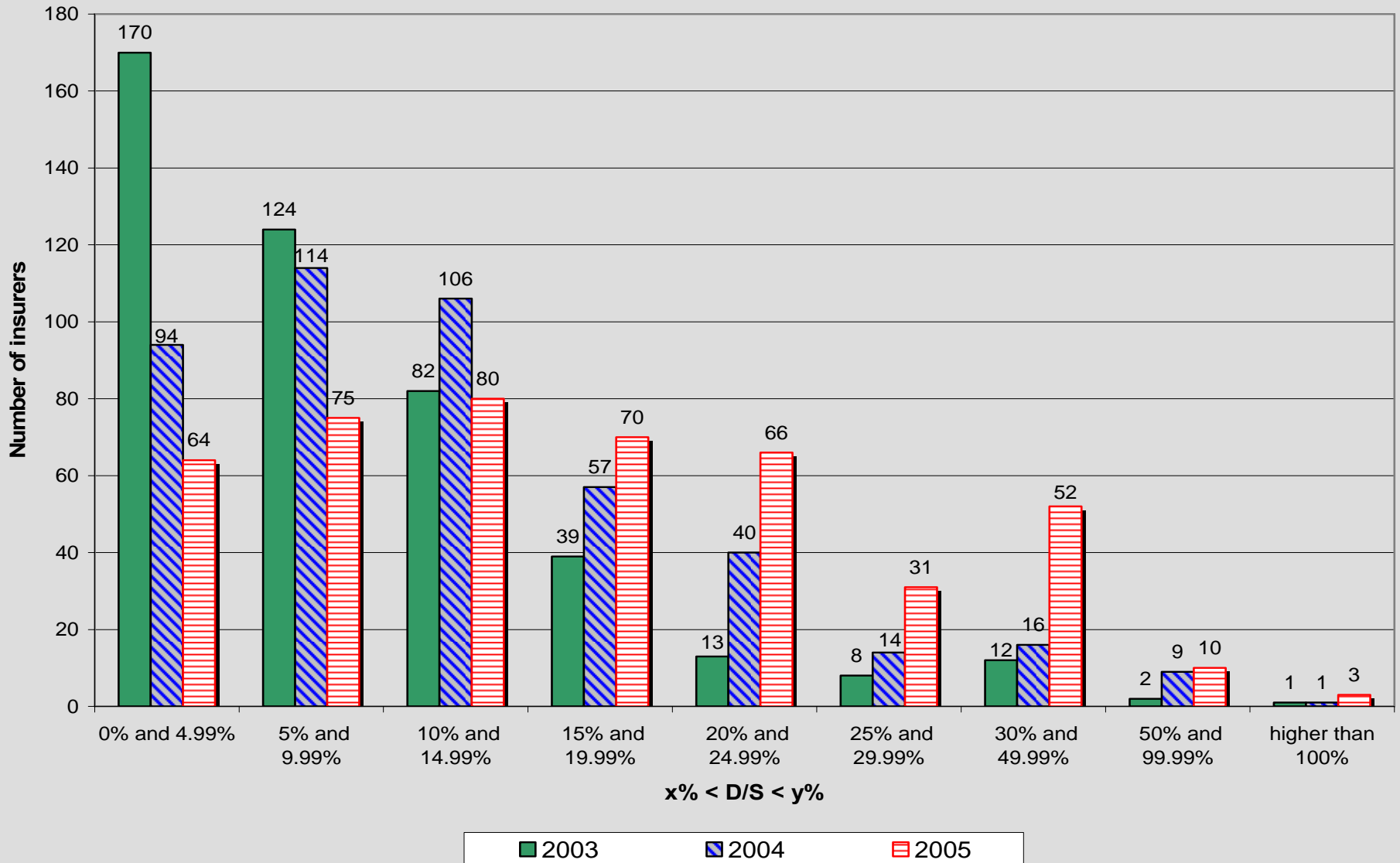
Utilize deterministic scenarios  
(e.g. 5-6 ton truck bomb explosion)

Consider aggregate exposure (E) under from a given scenario and relate to surplus (S)

Coverage is determined by computing maximum acceptable E/S ratio (e.g.  $E/S = 10\%$ )

This E/S ratio is a proxy for their survival constraint  
The Deductible/Surplus ratio (D/S) is a proxy for E/S

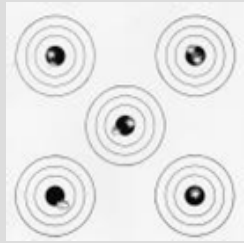
# Change in D/S Ratio for the Top 451 Insurers under TRIA (2003-2005)



# Loss Allocation Process

**L**

Loss Sharing Criteria	Insured Loss by insurers	Deductible of each insurer	Potential 10% above	Fed payment 90% above deductible	Total payment by insurer
	L1	D1			
	L2	D2			
	L3	D			
	...	...			
	Ln	Dn			



Direct Losses potentially Covered by Insurance

Covered Losses  
**L**

Insurers 1,2,3,..., n covering victims pay for insured losses; possible loss-sharing with federal government

Interdependent losses not covered by insurance

Some victims did not purchase Terrorism insurance

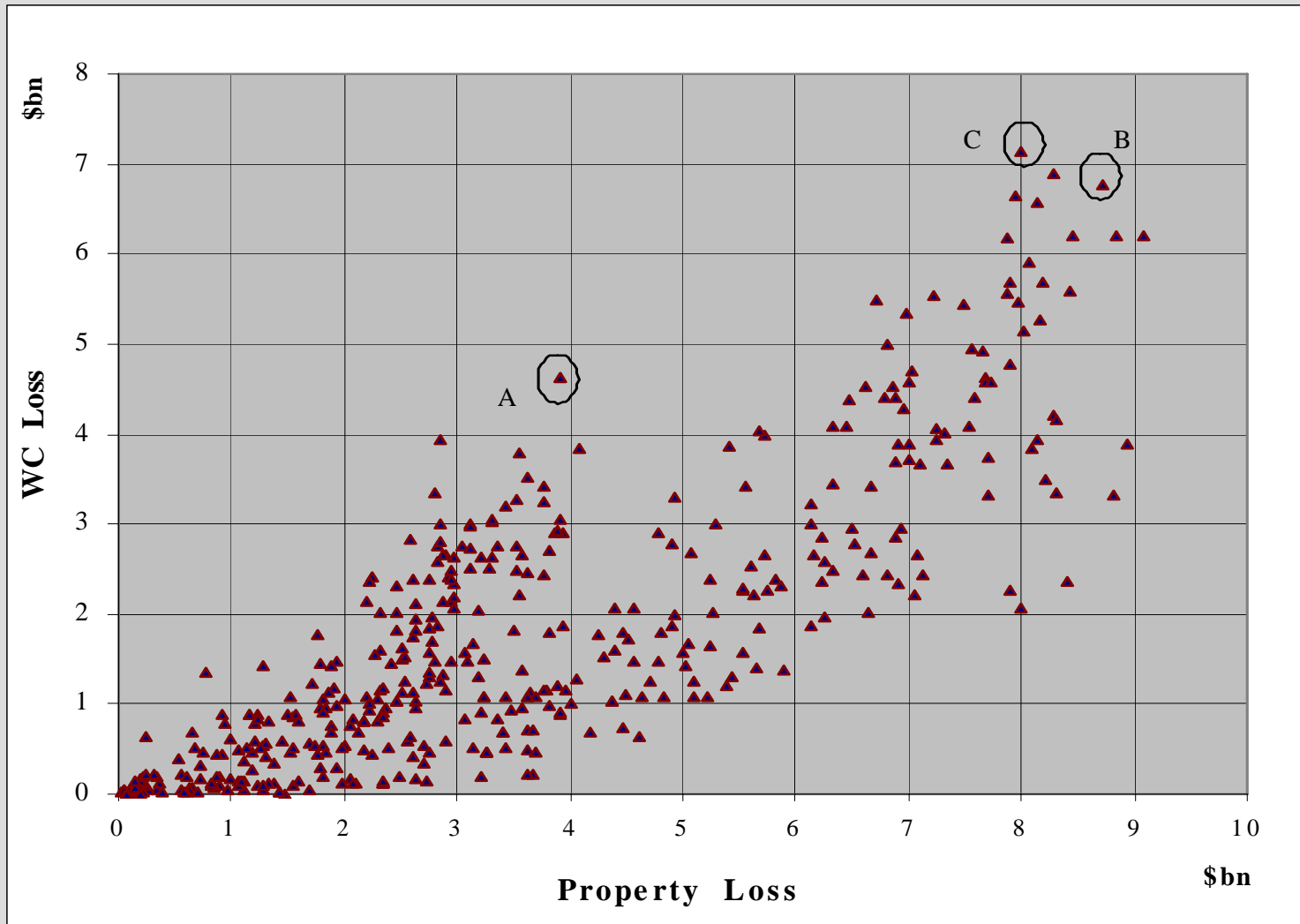
What target?  
Where?  
What mode of attack?

Limitations of insurance coverage  
What part of your loss is effectively covered by insurance contract?

What is the Insurance penetration?  
What is included without terrorism insurance (e.g., WC, fire following)

Who pays what?  
Public-private loss sharing

# Property Losses and Workers' Compensation Losses from 5-Ton Bomb Attacks to 447 High Rise Buildings in the United States



# Will Insurers Strategize if TRIA is Made Permanent?

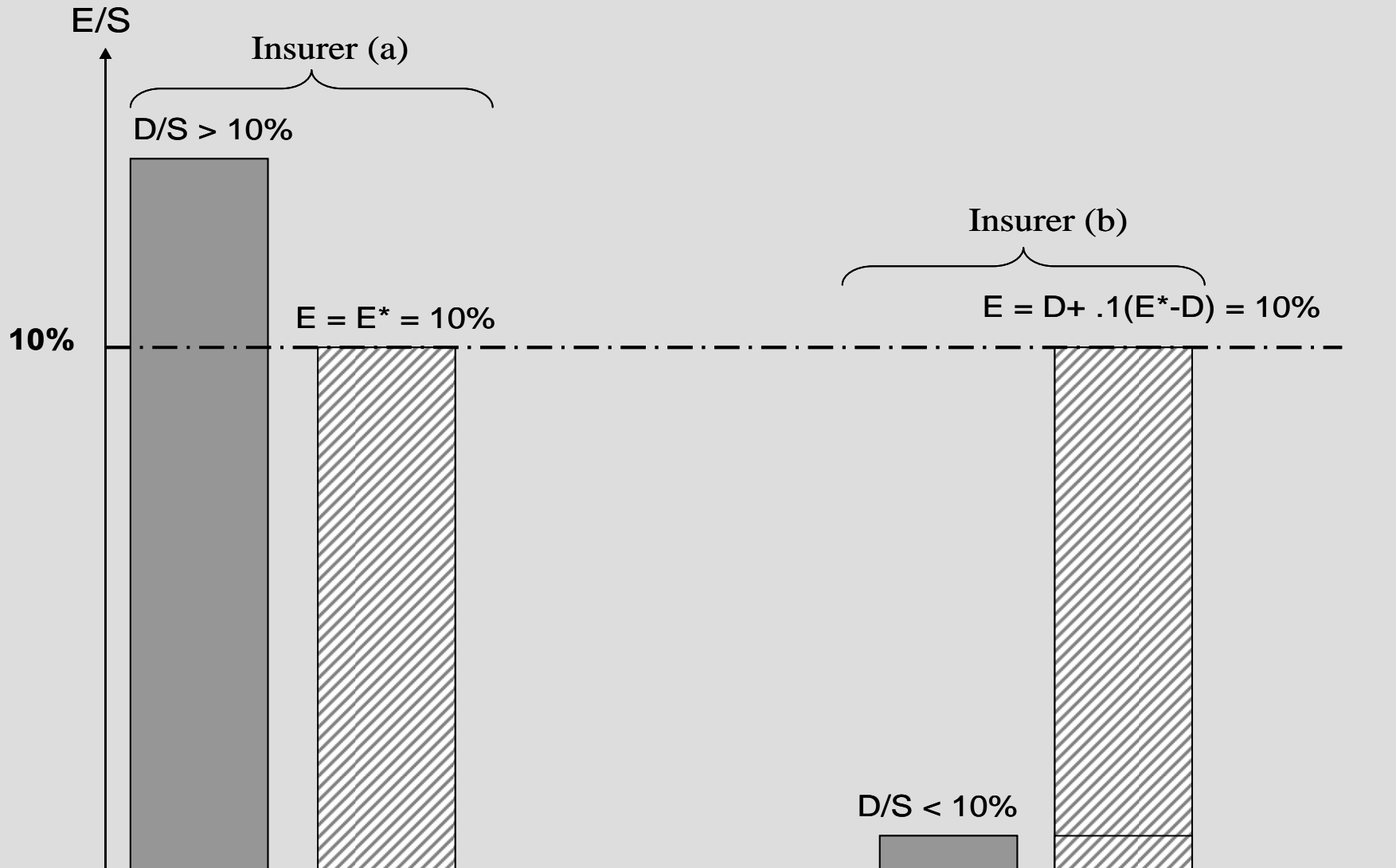
Insurers pay for all losses they incur below this deductible ( $D$ ) and 10% of the loss above  $D$ , the remaining 90% eventually paid by other parties (taxpayers, policyholders)

Collect all premiums

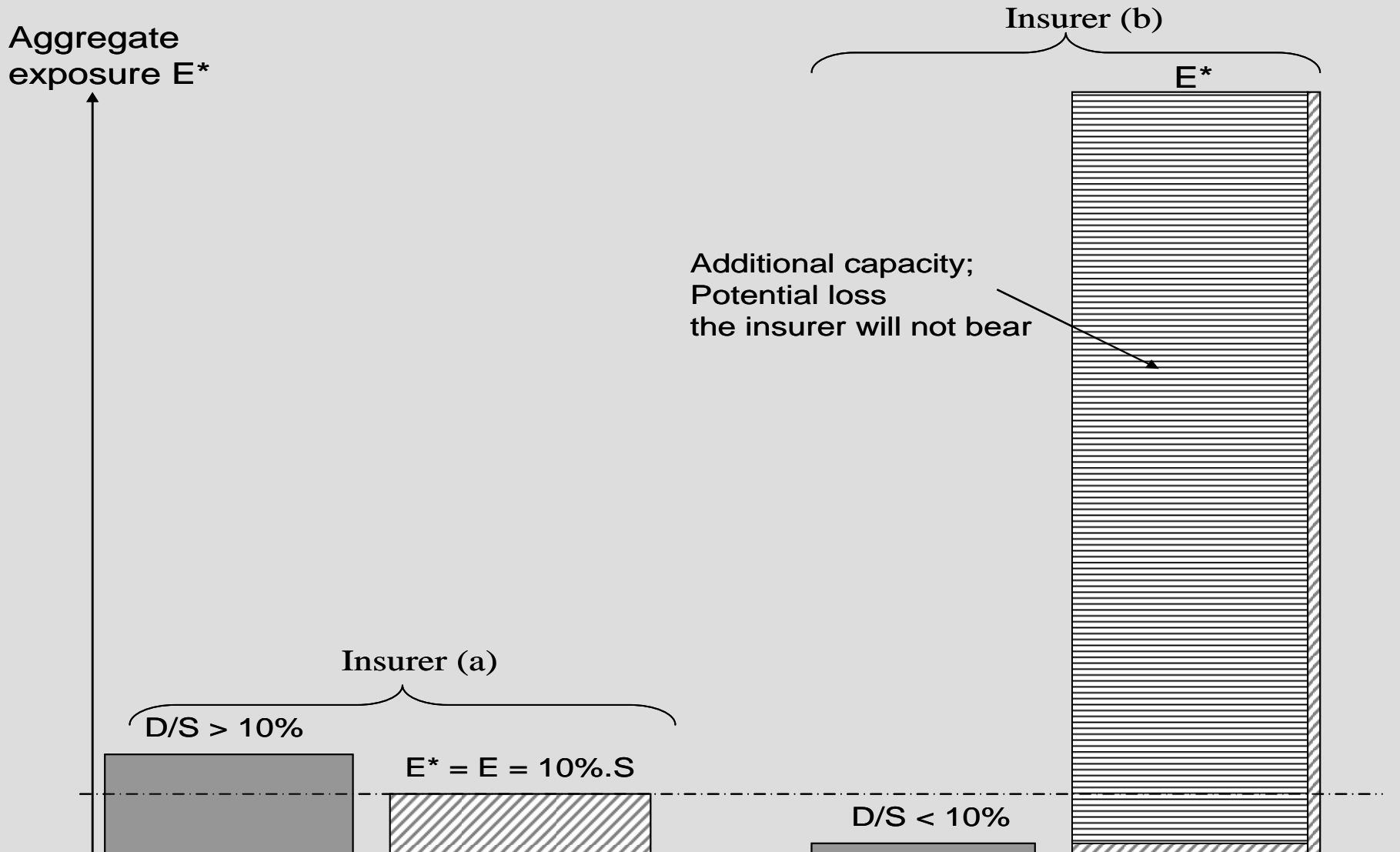
Economic incentive for any insurer with a low deductible/surplus ( $D/S$ ) ratio to write a large number of policies in a concentrated area

Application with 10% of insurers' surplus at risk of terrorism

# Insurer's Exposure Limited to 10% of Its Surplus



# Aggregate Exposure - Additional Capacity Provided by Insurers with $D/S < 10\%$



# Distribution of Losses under TRIA Today and if TRIA is Made Permanent

## (\$25 billion Loss in New York City)

NYC		Insured Loss Sharing			
SCENARIOS	Non-insured	Total insured	Insurers' Payments	All Policyholders	Final Fed. Gov Taxpayers
<b>TRIA Today – 50% take-up rate on Property Insurance – Top 23 insurers</b>					
<b>Total: \$25bn</b> <small>Property: \$15bn; WC: \$10bn</small>	<b>\$7.5bn</b>	<b>\$17.5bn</b>	<b>\$13.3bn</b>	<b>\$1.7bn</b>	<b>\$2.5bn</b>
<i>Insured loss sharing</i>			<i>76%</i>	<i>9.8%</i>	<i>14.2%</i>
<b>TRIA Extended Indefinitely – 100% take-up rate – Top 23 insurers</b>					
<b>Total: \$25bn</b> <small>Property: \$15bn; WC: \$10bn</small>	<b>\$0</b>	<b>\$25bn</b>	<b>\$8.4bn</b>	<b>\$6.6bn</b>	<b>\$10bn</b>
<i>Insured loss sharing</i>			<i>46%</i>	<i>14%</i>	<i>40%</i>
<b>Δ in final payments</b>			<b>-37%</b>	<b>+288%</b>	<b>+400%</b>
<b>TRIA Today – 50% take-up rate (TRIA-line premium market) – Top 23 insurers</b>					
<b>Total: \$100bn</b> <small>Property: \$50bn; WC: \$50bn</small>	<b>\$25bn</b>	<b>\$75bn</b>	<b>\$24bn</b>	<b>\$0</b>	<b>\$1bn</b>
<i>Insured loss sharing</i>			<i>32%</i>	<i>0%</i>	<i>68%</i>
<b>TRIA Extended Indefinitely – 100% take-up rate– Top 23 insurers</b>					
<b>Total: \$100bn</b> <small>Property: \$50bn; WC: \$50bn</small>	<b>\$0</b>	<b>\$100bn</b>	<b>\$20.7bn</b>	<b>\$0</b>	<b>\$79.3bn</b>
<i>Insured loss sharing</i>			<i>20.7%</i>	<i>0%</i>	<i>79.3%</i>
<b>Δ in final payments</b>			<b>-14%</b>	<b>0%</b>	<b>+55%</b>

# Long-term Options for Terrorism Insurance

- Deploy Capital of Potential Target Firms
- Reduce Insurers'/Reinsurers' Tax Costs of Holding Capital
- Deploy Capital of Reinsurers
- Facilitate the Use of Terrorism Catastrophe Bonds
- Mutual Insurance Pools
- Publicly Administered Mutual Insurance
- Federal Reinsurance with Explicit Premiums

# Issues for Future Research

- Gaining Knowledge of Terrorism Premiums Collected
- Possible Federal Pre-Emption of Certain State Regulations and Requirements
- Considering Covering Both Domestic and Foreign Terrorism

# Summary and Conclusions

- Terrorism is a highly uncertain risk and hence presents insurability problems
- Under current TRIA structure insurers cover most losses from terrorist attacks due to high deductible (currently 15%)
- Little indication that reinsurers and capital markets have appetite for covering catastrophic losses from a terrorist attack
- Federal government may be needed to deal with catastrophic losses
- TRIA in its current form is **not** an efficient and equitable solution to the terrorism problem
- There is a need for a longer-term study to examine role of public and private sectors in dealing with terrorism and other extreme events (e.g. natural disasters, catastrophic losses)
- Call for a national commission to be established by Congress / White House