Product and Workplace Safety

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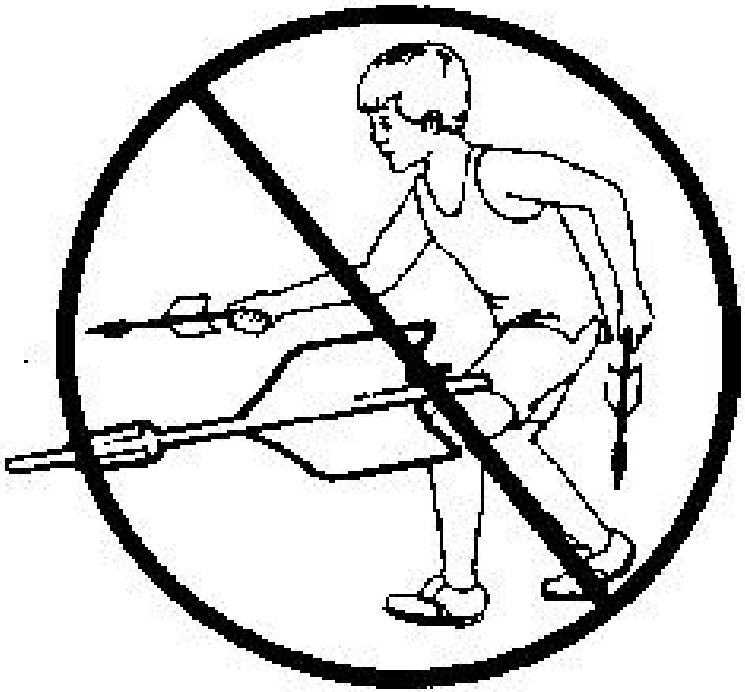


Following Recent Injury CPSC Reissues Warning: Lawn Darts Are Banned and Should Be Destroyed, US Consumer Product Safety Commission Release #97-122

Product Safety

- There are a wide range of ways in which the government regulates the safety of various products
  - Requiring safety labels
  - Childproof caps
  - Restrictions on contents of products
  - Mandating certain safety features
- Today we're going to consider whether there is a need for government regulation
- An alternative way to think about the question: what market failures are related to product safety and how do we correct them?

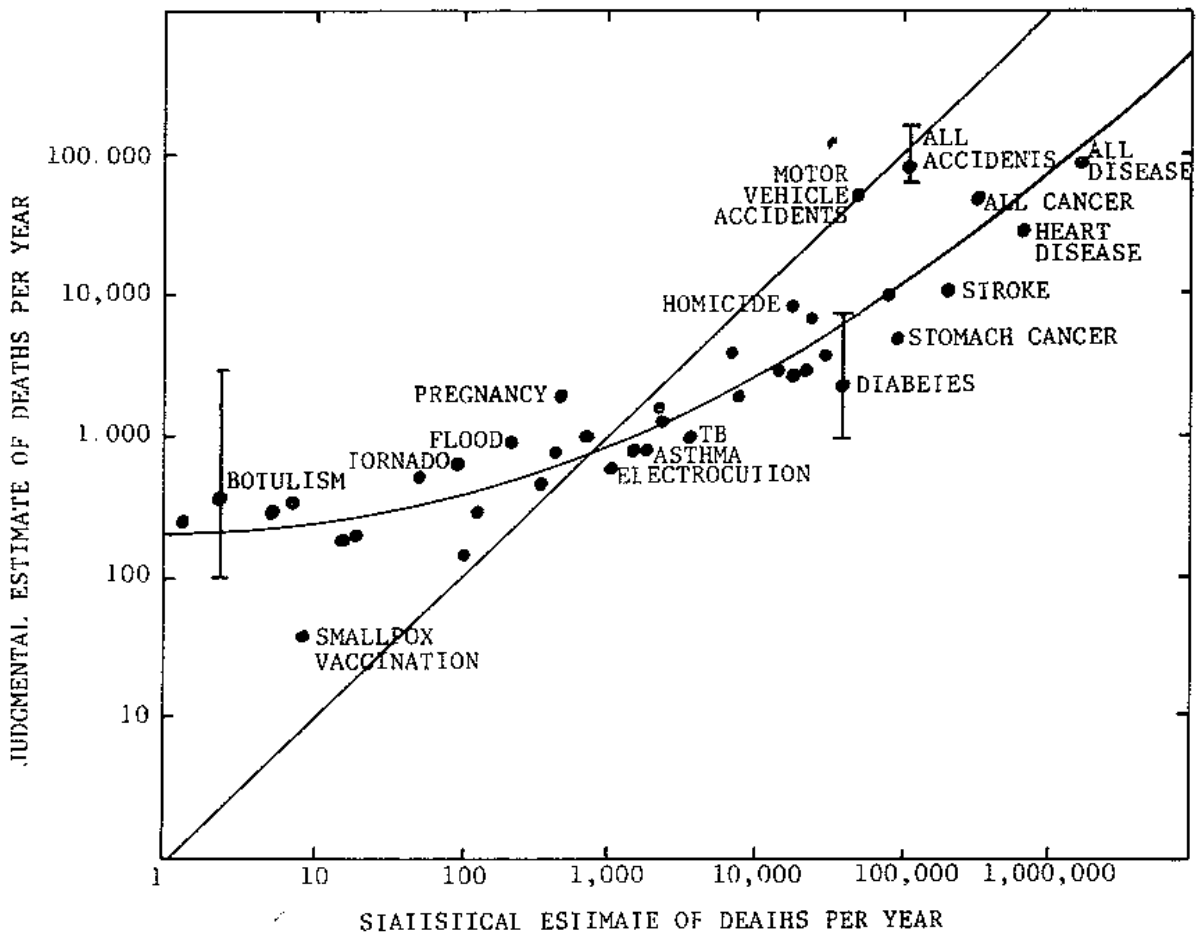
Product Safety and Market Outcomes

- Before getting into types of government regulation, let's think about when markets will handle things
- The basic idea is that if consumers value reductions in risk, they'll pay for them
- In theory this will get us the efficient level of product safety:
  - If the marginal benefit to consumers of an increase in safety exceeds the marginal cost to manufacturers, it will be profitable to make the product safer and charge more
  - If not, no improvement in safety will happen (leaving the product dangerous is actually a good thing in terms of total surplus)
- Recall the car features and cereal examples

Product Safety and Market Outcomes

- So why don't we always let the market figure out the proper level of product safety?
- It doesn't work if consumers don't know the risks or can't properly evaluate them
- Potential issues:
  - Consumers don't know effects of ingredients, chemicals, etc.
  - Consumers misperceive likelihood or magnitude of those effects
  - Firms don't reveal information

Product Safety and Market Outcomes



Product Safety and Market Outcomes

Risks that Increase the Annual Death Risk by One in One Million

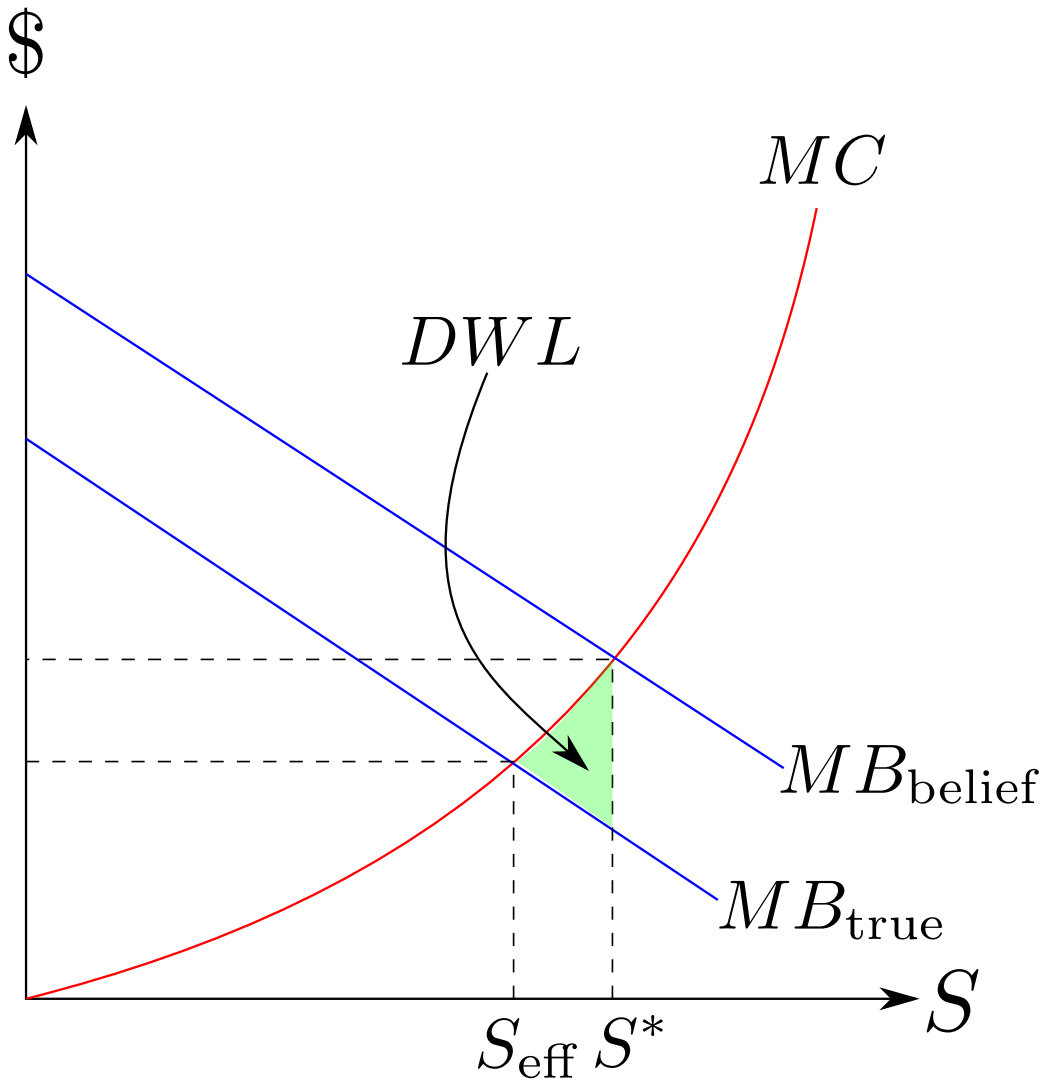
Activity	Cause of Death
Smoking xxx cigarettes	Cancer, heart disease
Spending xxx hours in a coal mine	Black lung disease
Traveling xxx miles by car	Accident
Flying xxx miles by jet	Accident
Living xxx months with a cigarette smoker	Cancer, heart disease
XXX chest X-rays	Cancer caused by radiation
Drinking xxx 24-oz soft drinks from banned plastic bottles	Cancer from acrylonitrile monomer
Eating xxx charcoal-broiled steaks	Cancer from benzopyrene
Drinking xxx 12-oz cans of diet soda	Cancer caused by saccharin

Product Safety and Market Outcomes

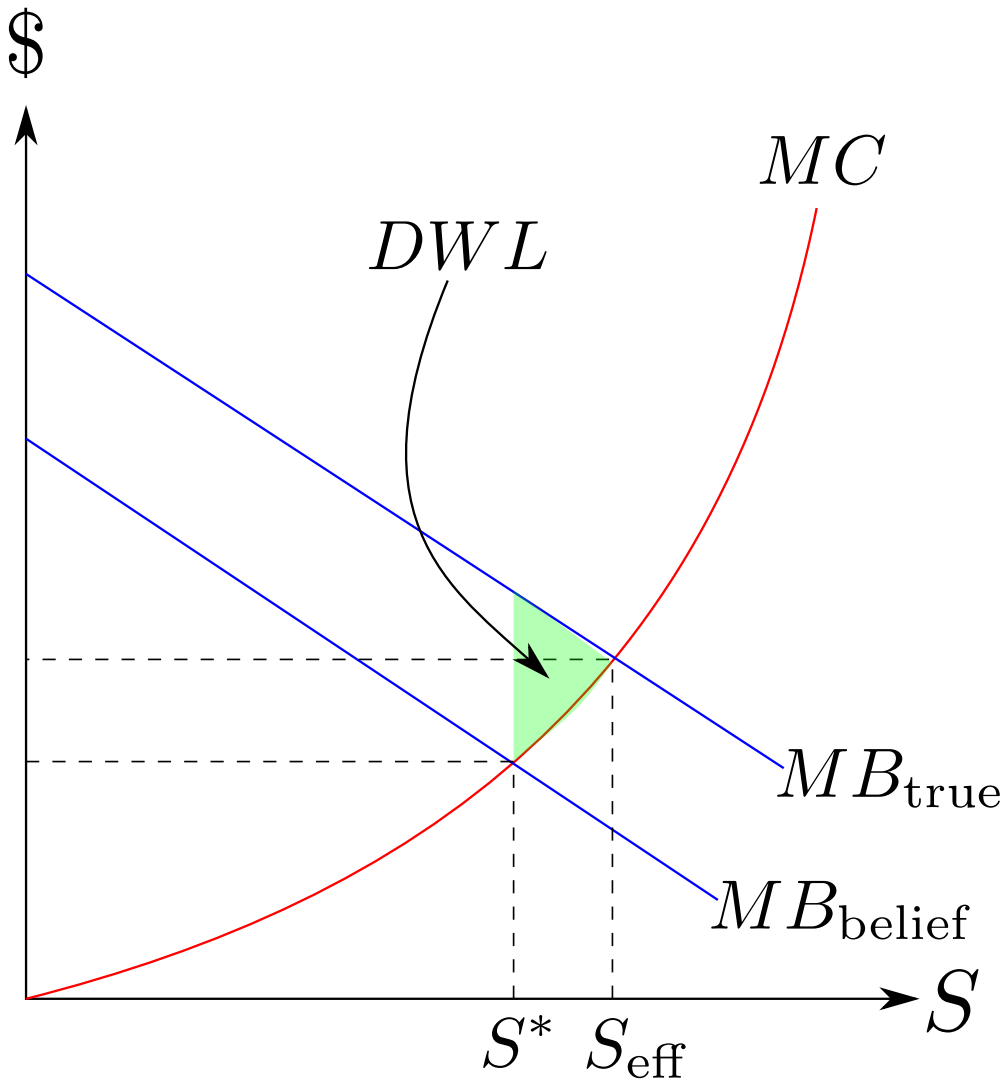
Risks that Increase the Annual Death Risk by One in One Million

Activity	Cause of Death
Smoking 1.4 cigarettes	Cancer, heart disease
Spending 1 hour in a coal mine	Black lung disease
Traveling 150 miles by car	Accident
Flying 1,000 miles by jet	Accident
Living 2 months with a cigarette smoker	Cancer, heart disease
One chest X-ray	Cancer caused by radiation
Drinking 1,000 24-oz soft drinks from banned plastic bottles	Cancer from acrylonitrile monomer
Eating 100 charcoal-broiled steaks	Cancer from benzopyrene
Drinking 30 12-oz cans of diet soda	Cancer caused by saccharin

Misperceived Risk and Deadweight Loss: Botulism



Misperceived Risk and Deadweight Loss: Electrocution



Product Safety and Market Outcomes

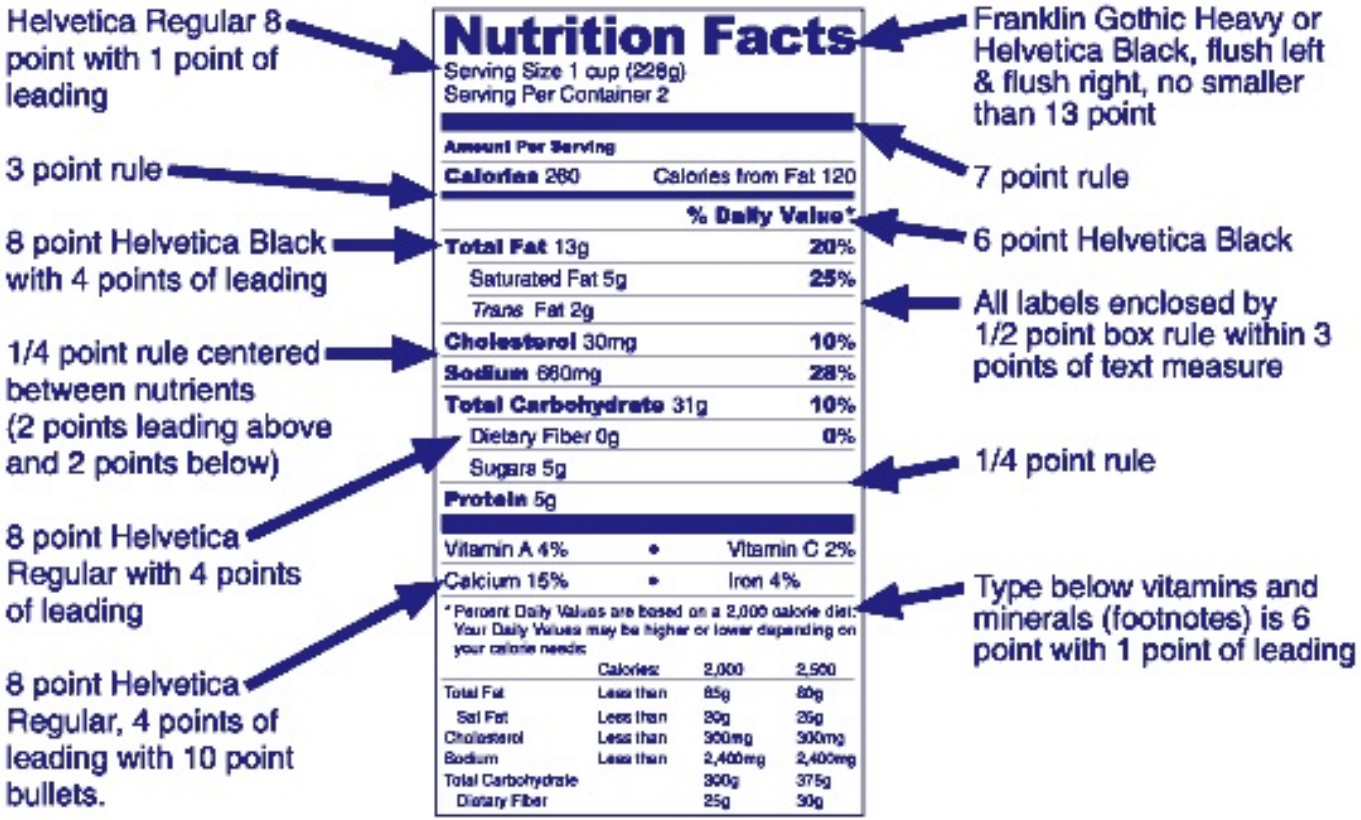
- So what can we do about customers being wrong?
- First, is it a problem? Is a customer thinking their benefiting a benefit even if their wrong?
- If we do want to help them accurately assess risk:
  - Provide them with more information
  - Nutrition labels
  - Safety warnings
  - Efficacy labels

Providing Customers with Information

SURGEON GENERAL'S WARNING: Smoking Causes Lung Cancer, Heart Disease, Emphysema, and May Complicate Pregnancy.

Providing Customers with Information

Providing Customers with Information



Providing Customers with Information

Customer Response to Information

- There is still a question of whether customers use this information
- Let's look at a study by Viscusi, Magat and Huber ("Informational Regulation of Consumer Health Risks")
- They present people with different bottles of bleach and drain cleaner
- The difference is whether safety warnings appear and how big those safety warnings are
- The authors then observe whether the consumers with better information take better actions

Customer Response to Information

TABLE 1 Summary of Products and Label Characteristics

Label	Percentage of Risk Information (*WARNAREA*)	Label Format
Bleach		
No Warning	0	Standard
Clorox	31	Standard
Bright	41	Standard, but More Prominent Risk Information
Test	69	Formatted to Highlight Uses, Risks, and Precautions
Drain Opener		
No Warning	0	Standard
Drano	78	Standard
Test	63	Formatted to Highlight Uses, Risks, and Precautions

Customer Response to Information

TABLE 3 Effects of Labels on Precautions for Bleach

Precautions	Fraction Taking Precaution Label Format				Maximum Incremental Effect of Labels
	No Warning	Clorox	Bright	Test	
(1) Do not mix with toilet bowl cleaner (if toilet is badly stained).	.17	.23	.32	.40	.23
(2) Do not add to ammonia-based cleaners (for particularly dirty jobs).	.69	.69	.67	.86	.17
(3) Store in childproof location.	.43	.64	.51	.76	.33

Customer Response to Information

TABLE 9 **Summary of Precautions-Related Decision Components**

(1) Precautions	(2) Mean Disutility of Precaution in Dollars per Bottle (Std. Dev.)	(3) Mean Number of Containers Used Annually	(4) Nature of Risk	(5) Annual Household Risk without Precautions	(6) Critical Benefits Value ($)
Bleach					
Do not mix bleach with ammonia-based products or toilet bowl cleaner.	.19 (.46)	12.2	Chloramine Gas Poisoning	.000058	37,900
Store bleach to prevent access to children.	.16 (.46)	12.2	Nausea and Stomach Cramps for One Day	.000061	32,000
Drain Opener					
Wear gloves to prevent drain opener hand burns.	.17 (.34)	1.78	Temporary Hand Burns	.000061	5,200
Store drain opener to prevent access by children.	.15 (.33)	1.78	Very Severe Internal Burns, Possibly Irreversible	.000041	6,500

Issues With Simply Providing Information

- The appeal of taking the labeling approach is that you leave the valuation of risk to the market
- Customers can choose more or less risk depending on their own preferences (which will differ across consumers)
- But there are major drawbacks:
  - Still difficult for customers to understand risk
  - Difficult to know what to label
  - Easy to overwhelm with information
- Two alternatives: use the courts, directly regulate safety features of products

Using the Courts

Table 3

BENEFITS AND COSTS RELATING TO FUEL LEAKAGE ASSOCIATED WITH THE STATIC ROLLOVER TEST PORTION OF FMVSS 208

BENEFITS:

Savings – 180 burn deaths, 180 serious burn injuries, 2100 burned vehicles.

Unit Cost – $200,000 per death, $67,000 per injury, $700 per vehicle.

Total Benefit – 180x($200,000)+180x($67,000)+2100x($700) = $49.5 million.

COSTS:

Sales – 11 million cars, 1.5 million light trucks.

Unit Cost – $11 per car, $11 per truck.

Total Cost – 11,000,000x($11)+1,500,000x($11) = $137 million.

Using the Courts

- Making companies liable for their products incentivizes them to consider product safety
- How liability works will determine what level of product safety firms provide
- Approaches to liability:
  - Negligence
  - Strict liability
  - Breach of warranty

Greenman v. Yuba Power Products, 1963

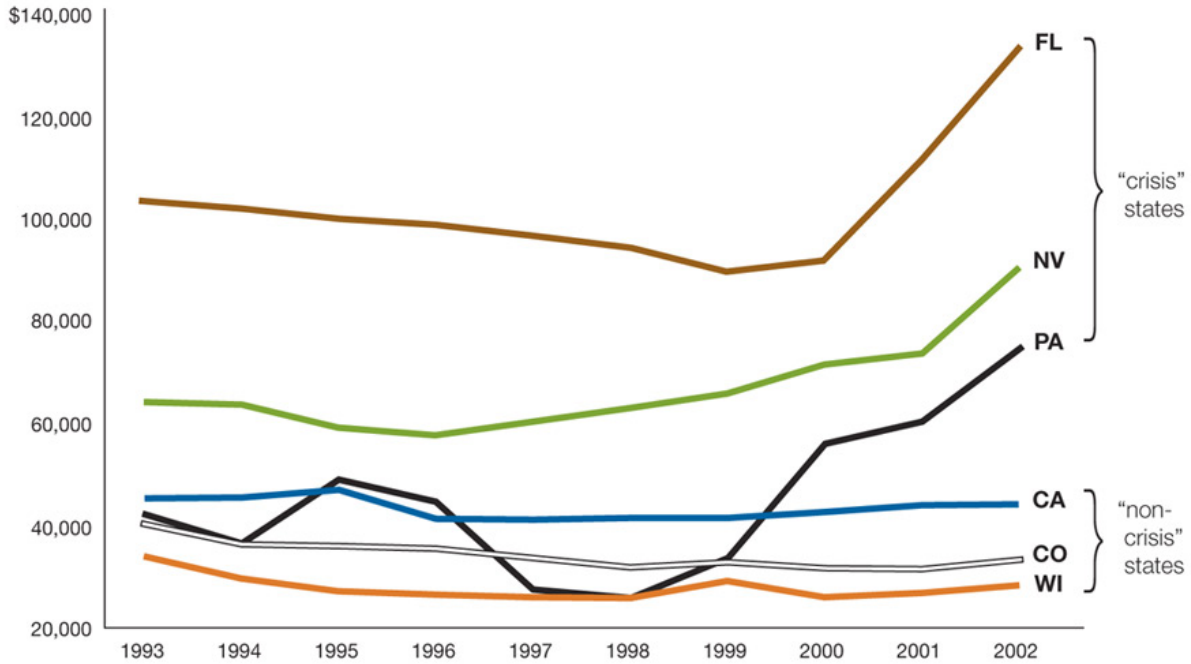
Greenman v. Yuba Power Products, 1963

Even if there is no negligence, however, public policy demands that responsibility be fixed wherever it will most effectively reduce the hazards to life inherent in defective products that reach the market. It is evident that the manufacturer can anticipate some hazards and guard against the recurrence of others, as the public cannot. Those who suffer injury from defective products are unprepared to meet its consequences. The cost of an injury and the loss of time or health may be an overwhelming misfortune to the person injured, and a needless one, for the risk of injury can be insured by the manufacturer and distributed among the public as a cost of doing business.

Using the Courts

Using the Courts

Figure 1. Average liability premiums for OBGYNs in select "crisis" and "non-crisis" states, 1993 to 2002

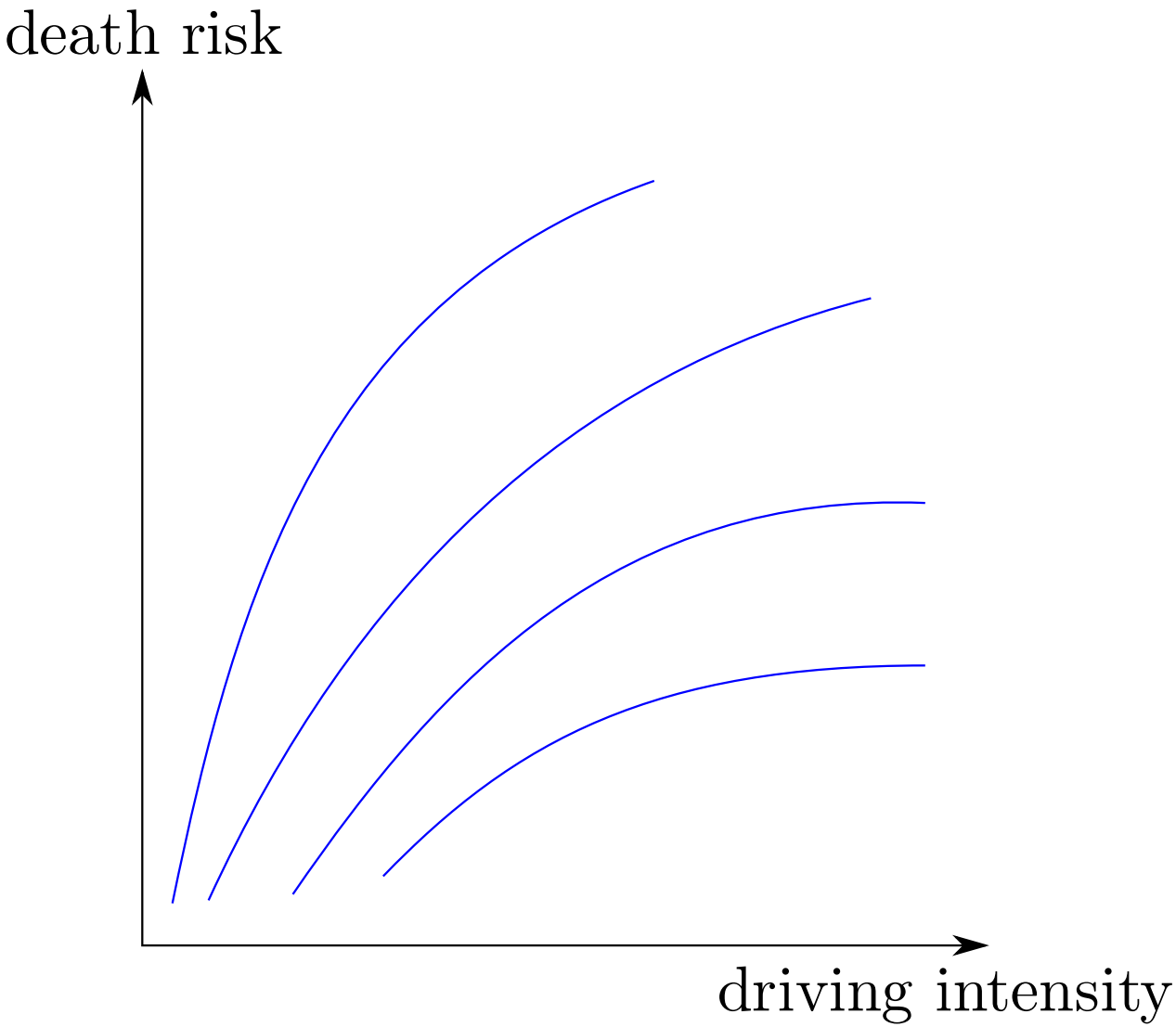


Source: Weighted average premiums based on author calculations from data reported in the Medical Liability Monitor Annual Rate Survey. All amounts in 2003 dollars.

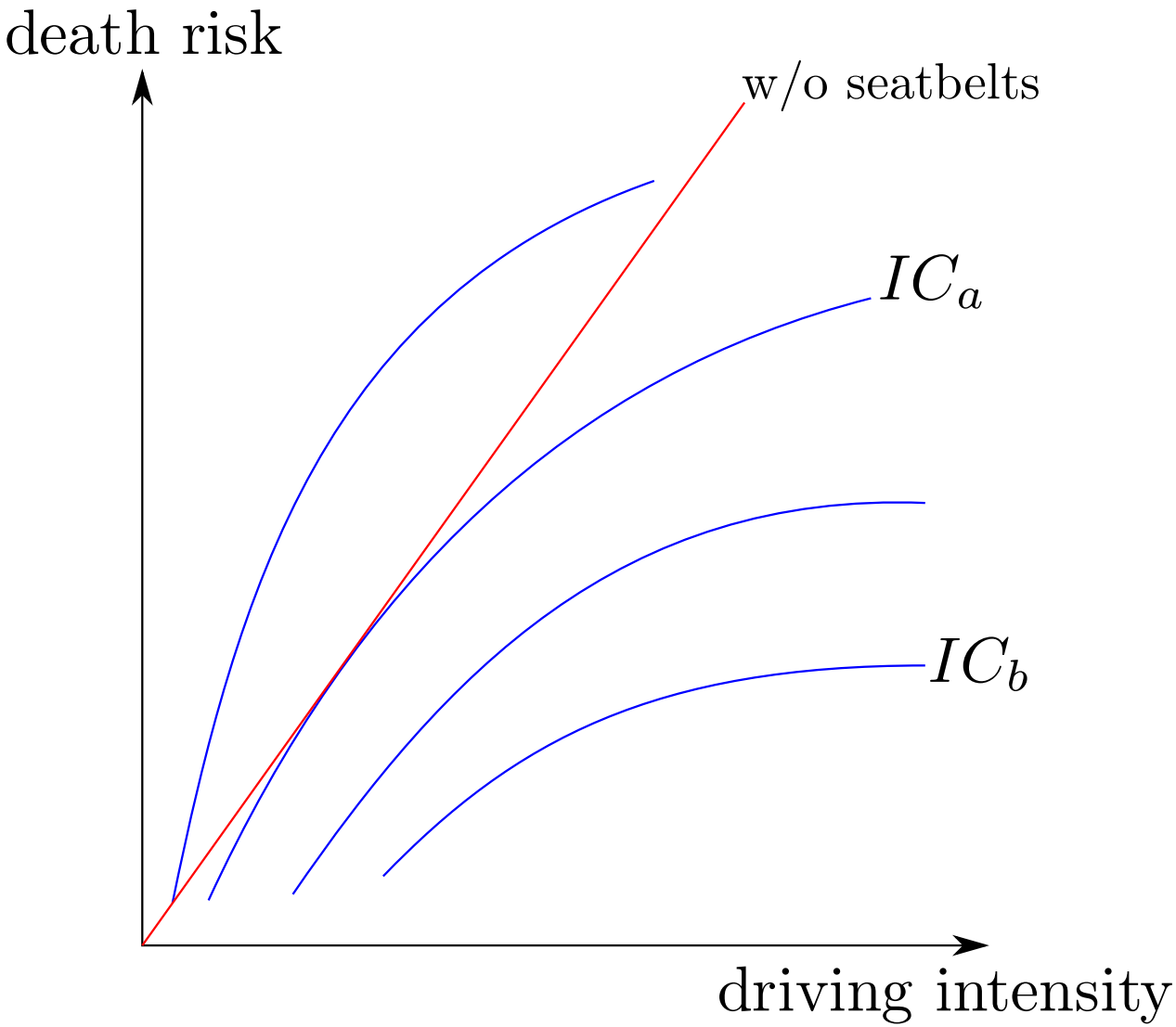
Direct Regulation of Product Safety

- There are limitations to using courts
- Cases can be expensive for all parties involved (loss of surplus)
- It can be difficult to pinpoint who is at fault (especially for cases related to long term health outcomes)
- Courts won't resolve the issue of externalities with product safety
- One final alternative is to directly regulate the safety of products
- Think of mandatory seatbelts and airbags, bans on certain chemicals, etc.

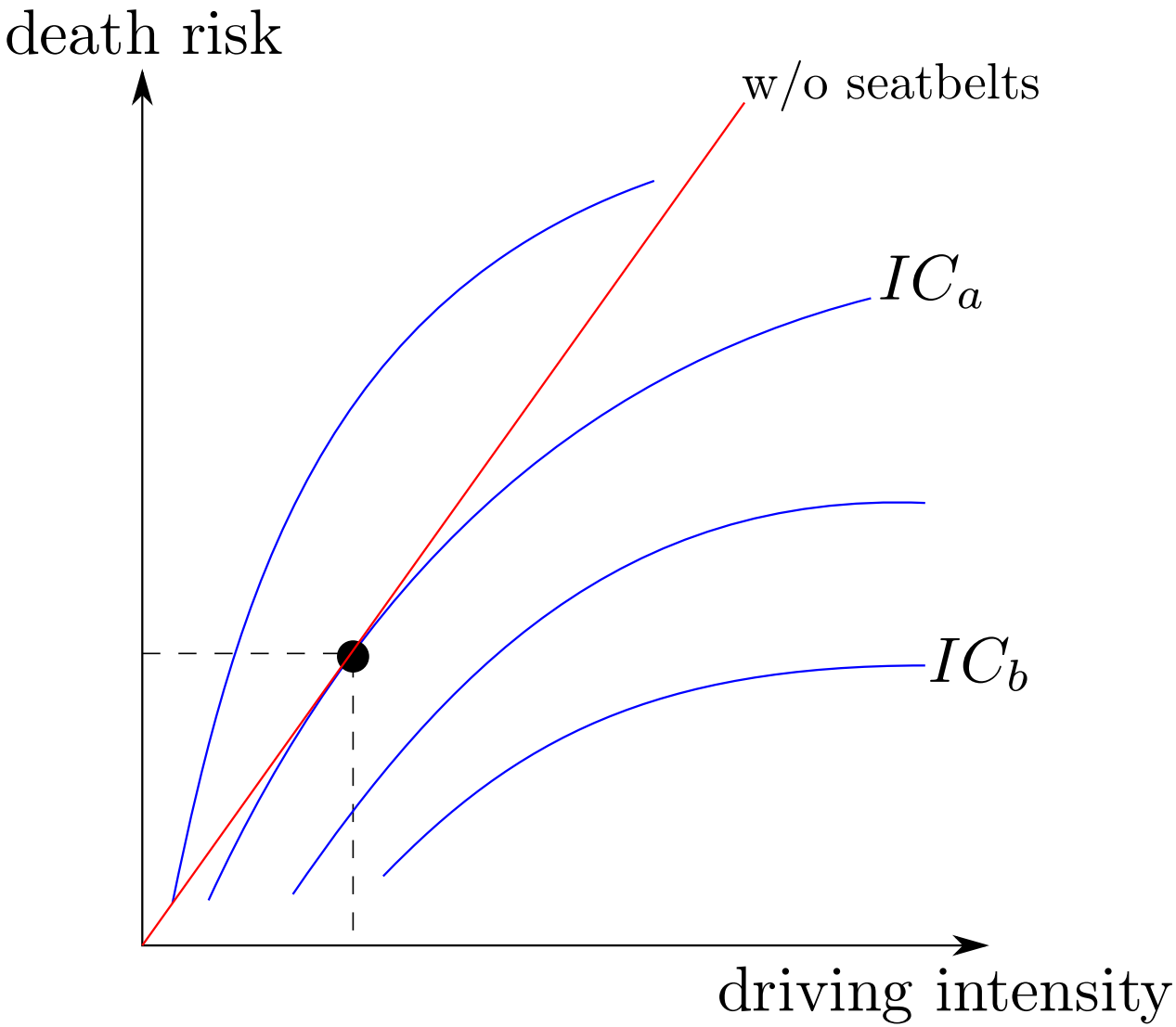
Peltzman's Critique



Peltzman's Critique



Peltzman's Critique



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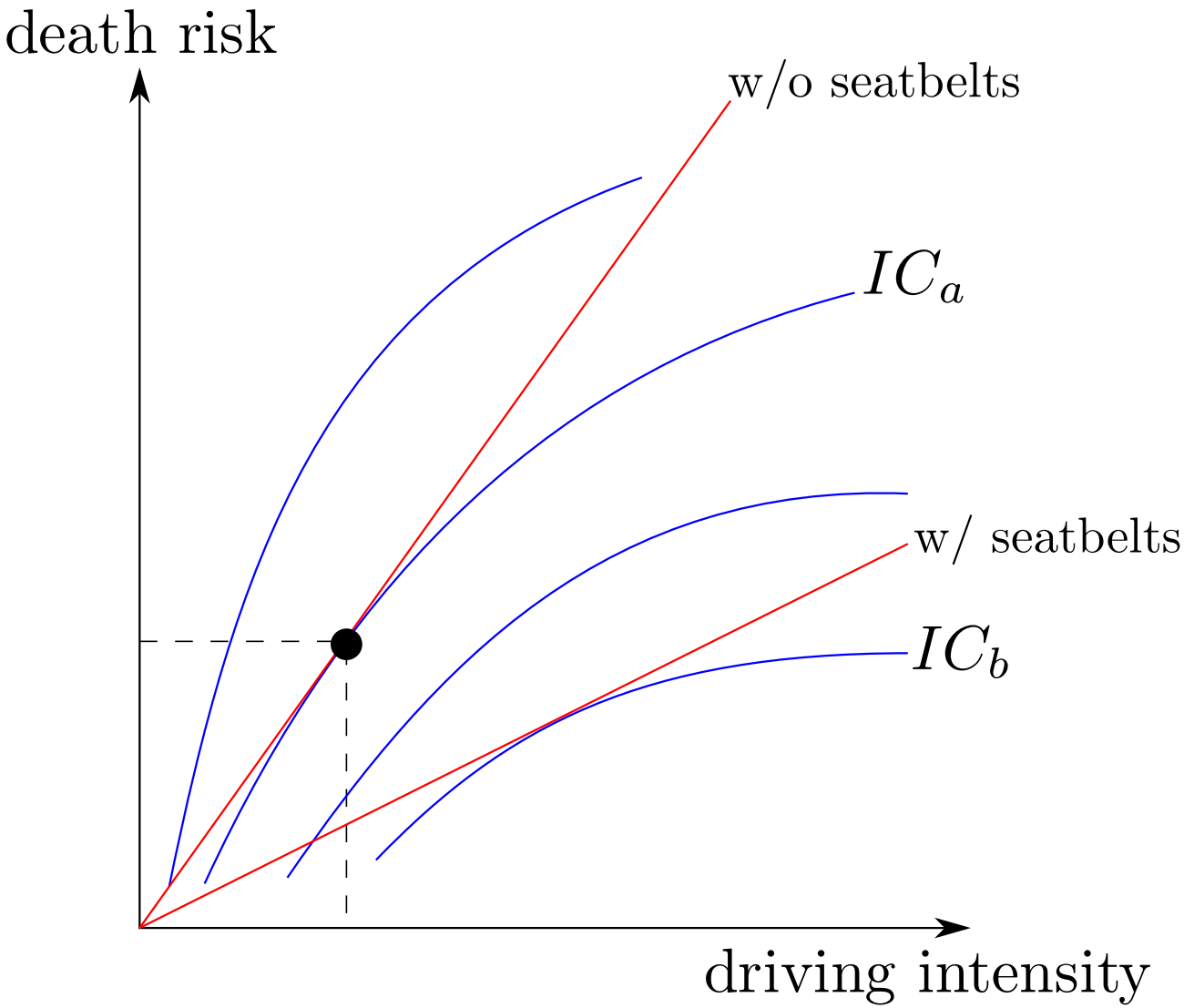

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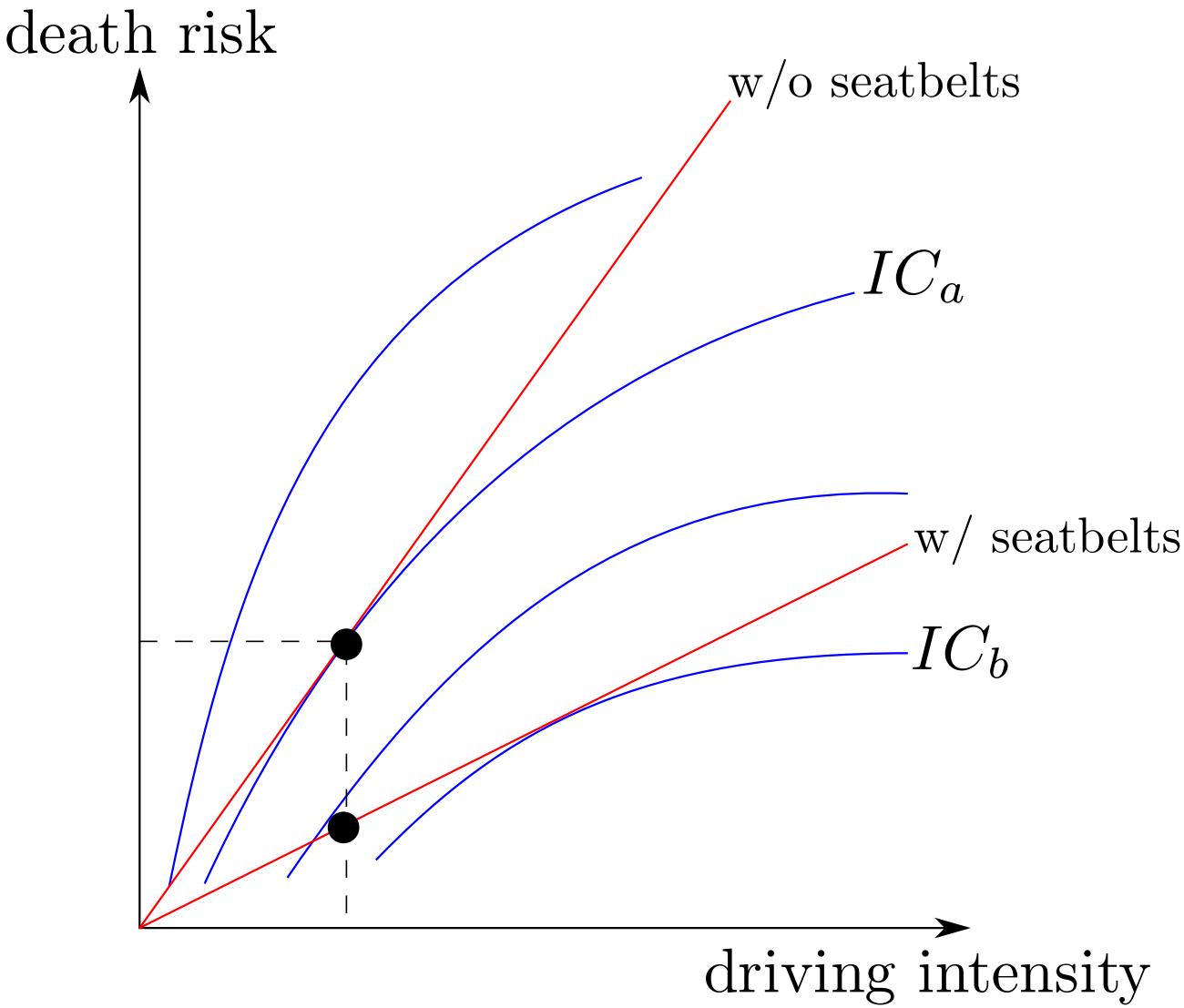

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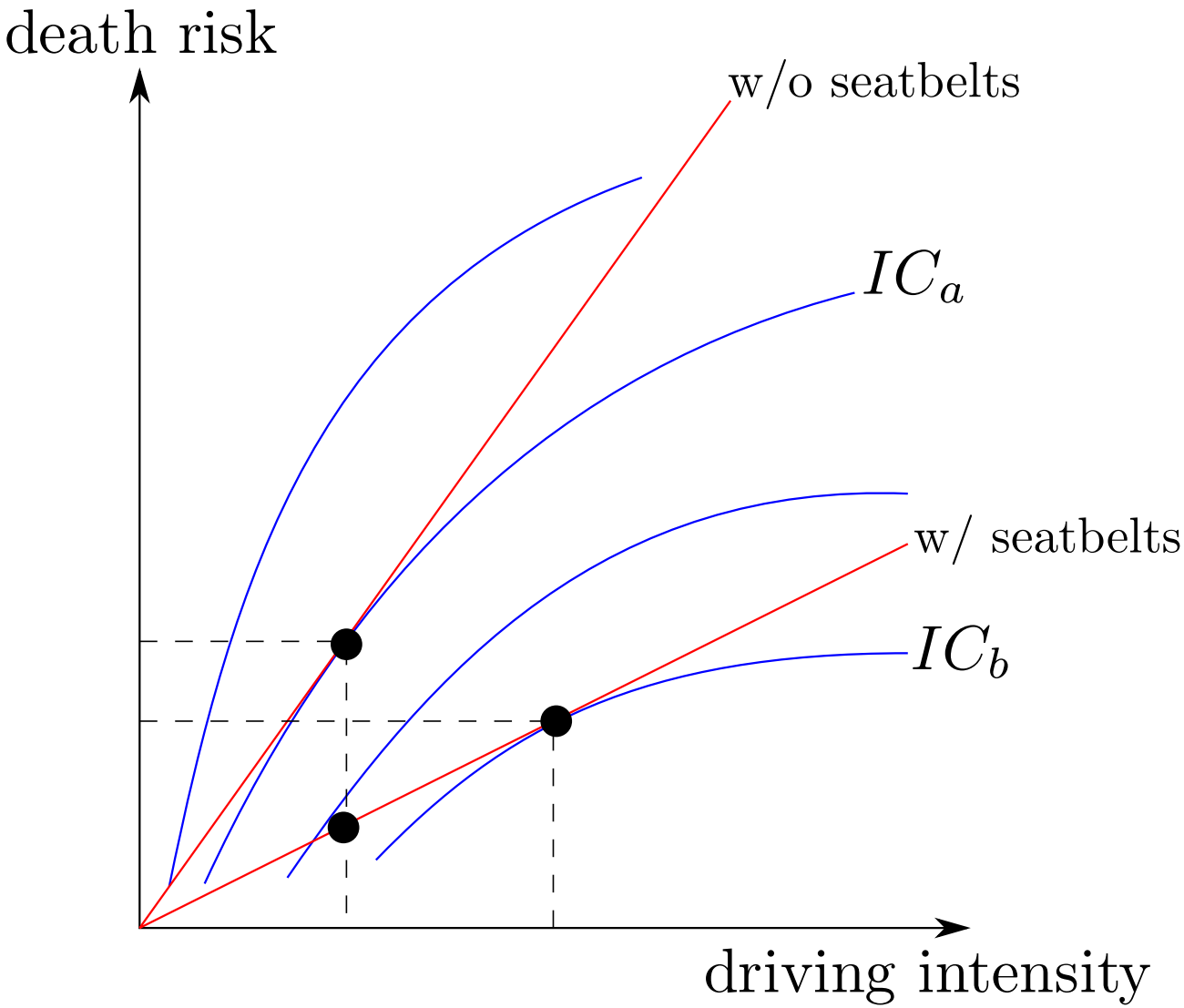


Other Considerations with Safety Standards

- Another issue is when even the regulator has uncertainty over the risk
- Think about the effects of a new genetic technology, new pesticide, etc.
- Long term effects are often unknown
- If potential hazards are catastrophic, error on the side of caution (restrictive regulation)
- If potential hazards are smaller, less restrictive regulation reveals more information over time

Other Considerations with Safety Standards

- Sometimes uncertainty over risk stems from just statistics
- For example, we know mercury in water is bad so EPA sets a limit of 0.002 mg/L
- But we can't test every drop of water, instead we have to sample
- What if the sample is 0.00201 mg/L? What if it's 0.00199 mg/L?
- Raises issues of Type I and Type II errors

Other Considerations with Safety Standards

- Hypothesis: Water is safe to drink (less than 0.002 mg/L of mercury)
  - Type I error: reject hypothesis when water is actually safe
  - Type II error: fail to reject hypothesis when water is actually unsafe
- EPA and FDA have typically been more concerned about type II errors
- Reduces risk of really bad outcome (but at expense of efficiency, safety is too high)

Recapping Product Safety Regulation

- We saw several ways in which product safety may be dealt with
- Markets will do some of the work for us: people will pay for safety, they won't pay for excessive safety
- When will markets fail us?
  - Incomplete information on part of consumer
  - Misperception of risk by consumer
  - Externalities

Recapping Product Safety Regulation

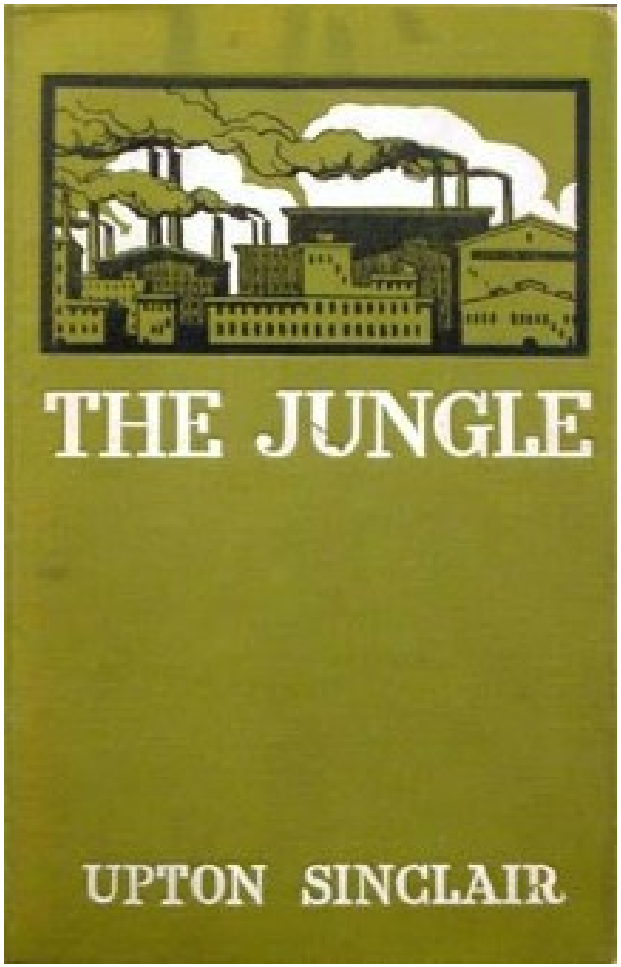
Solutions to these market failures:

- Inform consumers (product labels, ad campaigns, etc.)
- Use the courts (making companies liable for unsafe products)
- Direct regulation of safety (mandatory safety features, chemical bans, etc.)

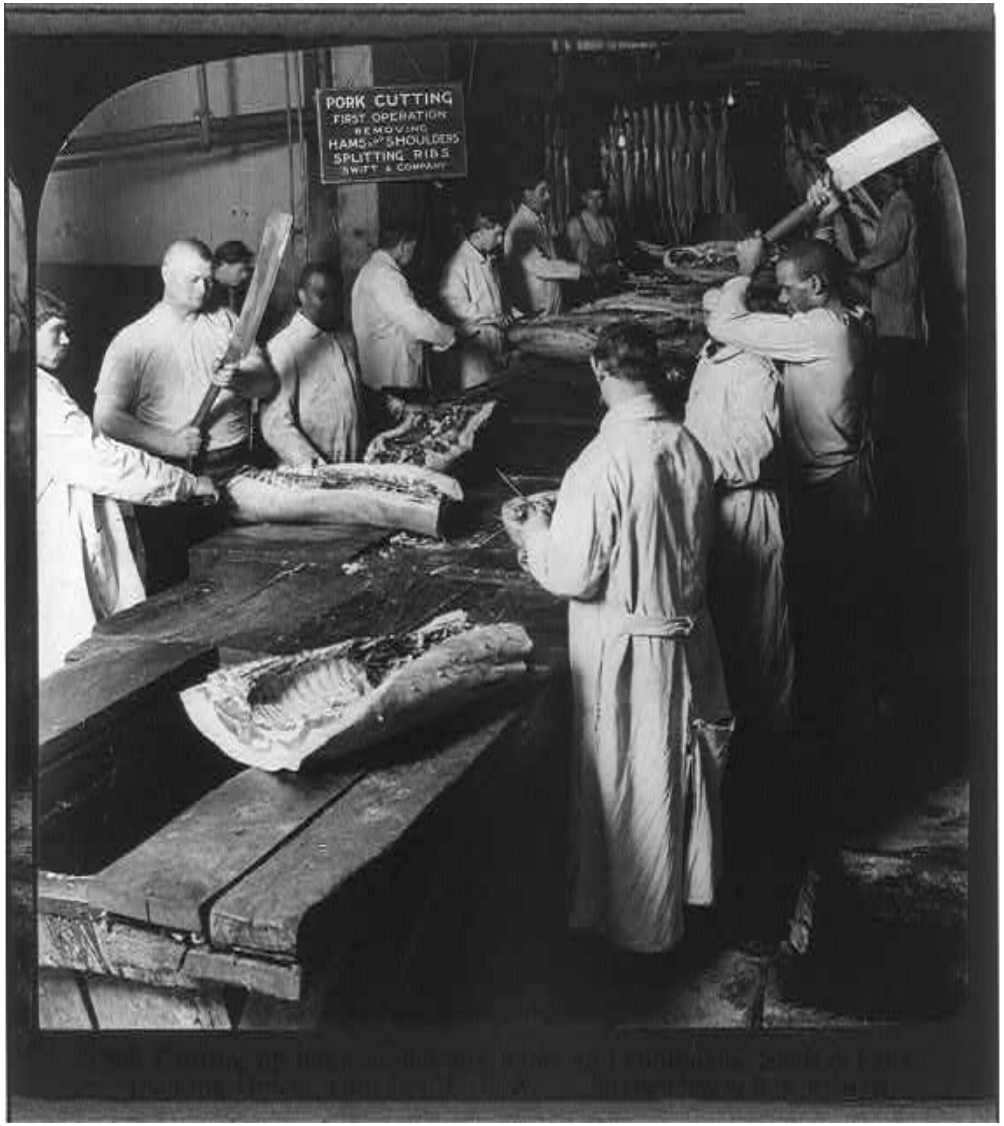
Recapping Product Safety Regulation

- All of these approaches have their downsides
- Customers may not use the information you give them properly
- Courts can be costly, it can be hard to determine who is liable, excessive awards may lead to too much caution
- Direct regulation can have unexpected behavioral effects
- Lots of uncertainty about costs and benefits of safety measures

Workplace Safety



Workplace Safety



Workplace Safety

- Many of the issues with product safety extend to workplace safety
- There are safety risks and reducing those risks involves a certain cost
- At issue is how to eliminate any units of risk for which the benefits of reduction exceed the costs
- There are some differences:
  - Different types of risks
  - Different market mechanisms: wages and option to quit rather than simply prices
  - More opportunities for learning
  - Different legal framework

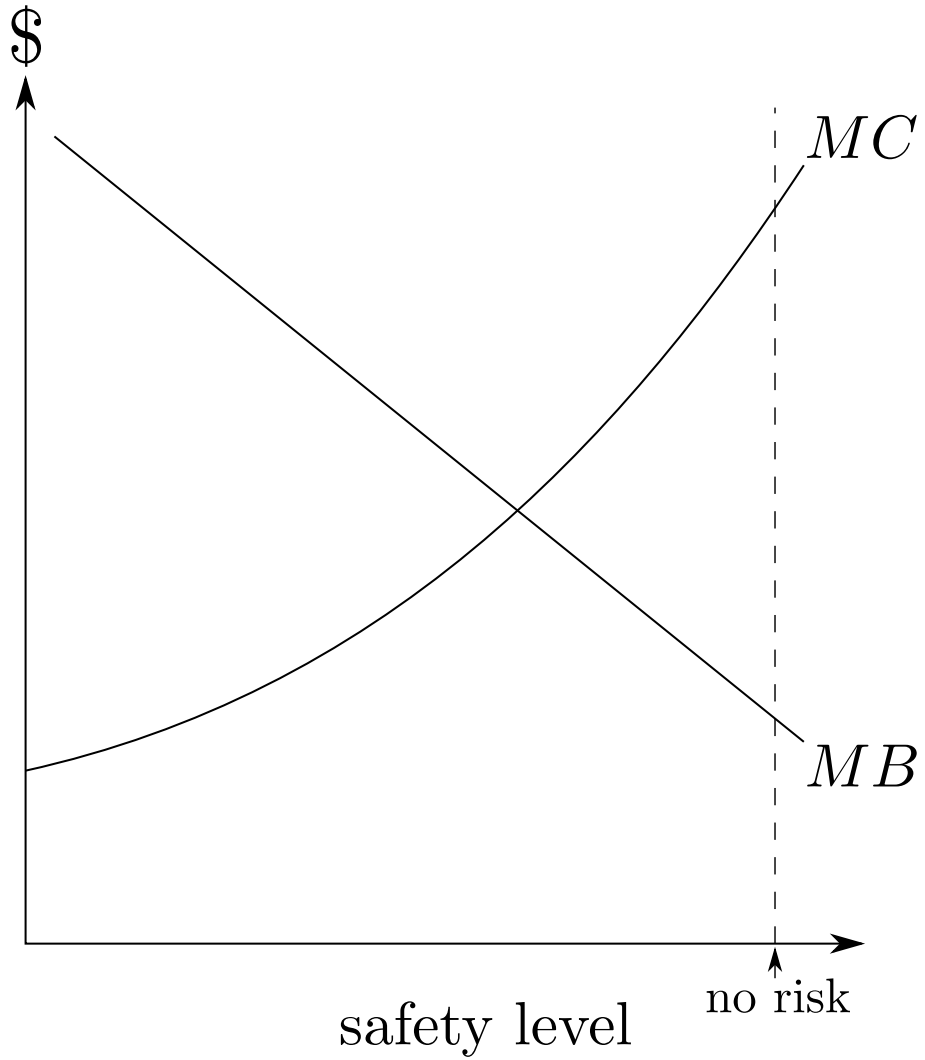
Workplace Safety and Markets

- The most direct way that markets price risk in the workplace is through wages
- Wages don't just price characteristics of workers, they also price characteristics of the job
- In general, you get paid more if you are willing to do a less desireable job (bad hours, unsafe conditions, etc.)
- This is the theory of compensating differentials

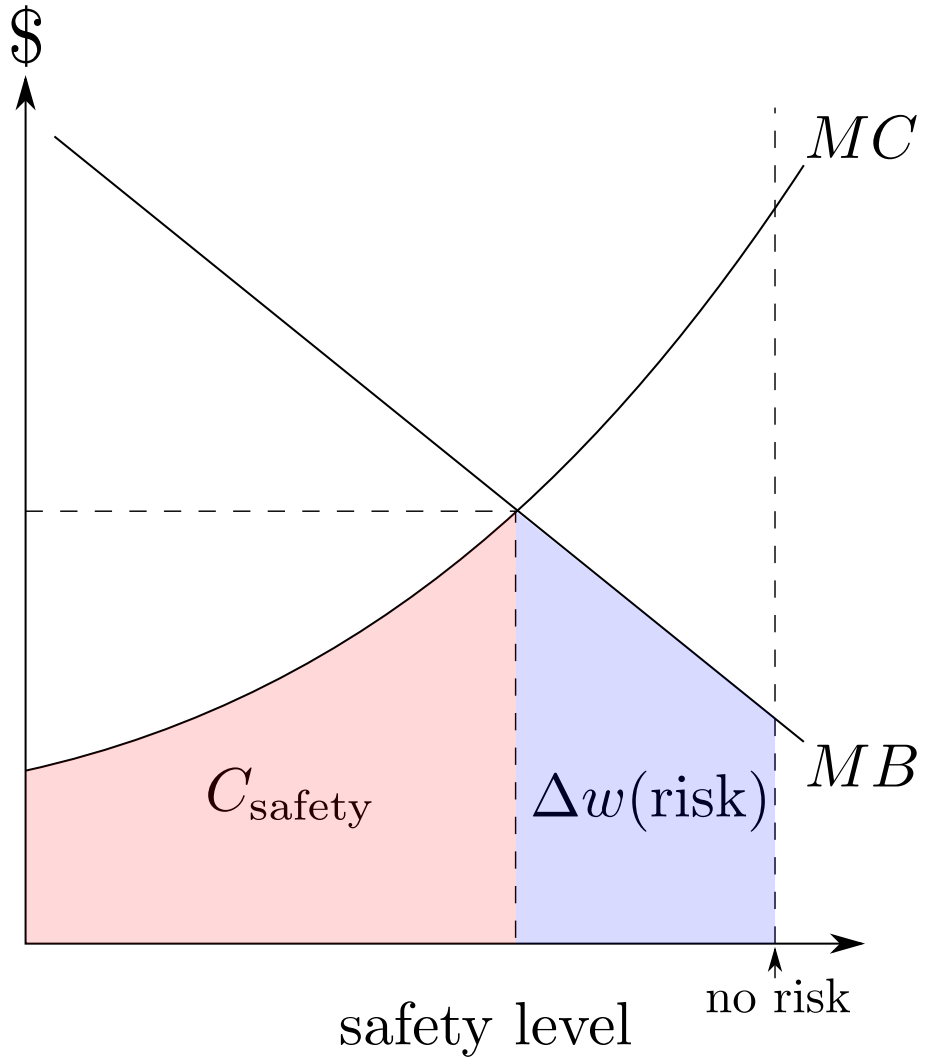
Compensating Differentials and Workplace Safety

Table 7: Results from the Current Population Survey	
Violent Crimes Per Capita	-5.4E-05
Air Quality Index	0.001347**
Unemployment Rate	6.56E-05***
Taxes Per capita	-8.4E-05
Spending Per capita	0.045599*
Population Growth	0.129715
Population Size	-3.58E-08
Age	0.082137***
Age^2	-0.00084***
Attained college degree	0.228125
Male	0.1945***
Veteran	0.015655
Black	-0.0845***
Asian	-0.12077***
NFL	-0.04234
N	32,564
R^2	0.2179

Compensating Differentials and Workplace Safety



Compensating Differentials and Workplace Safety

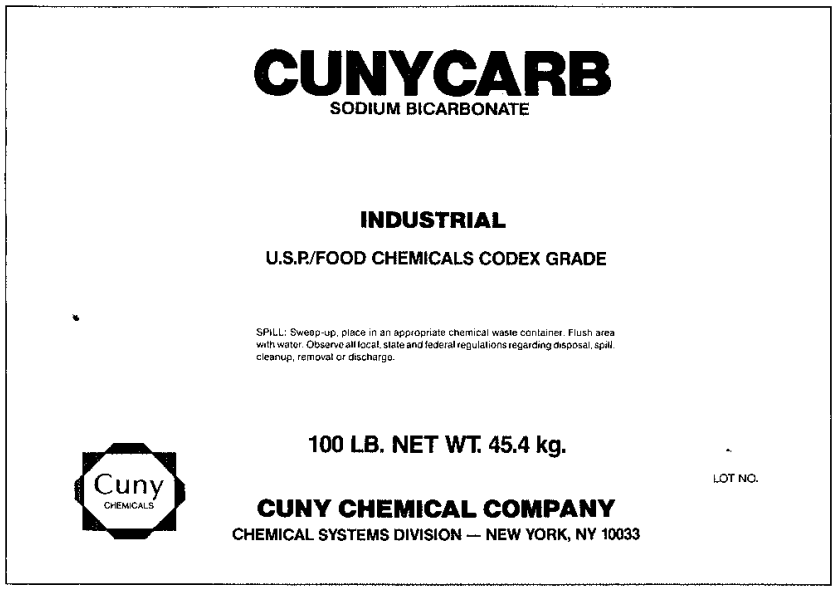


Compensating Differentials and Workplace Safety

Workplace Safety and Markets

- We do observe industries with higher accident rates having higher wages (controlling for other job and worker characteristics)
- The question is whether this gets us to the efficient level of workplace safety
  - Do workers know risks?
  - Safety versus health risks
  - How does bargaining power influence things?

Compensating Differentials and Workplace Safety



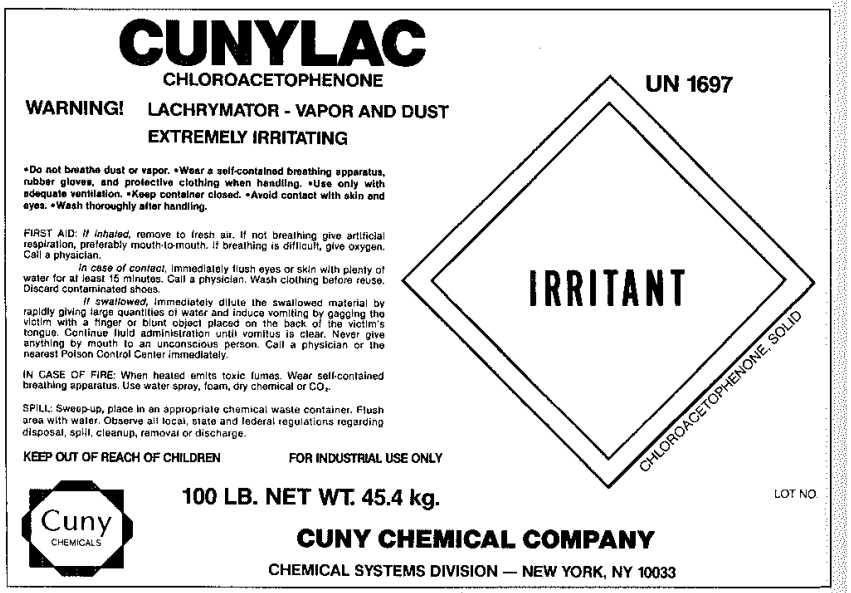
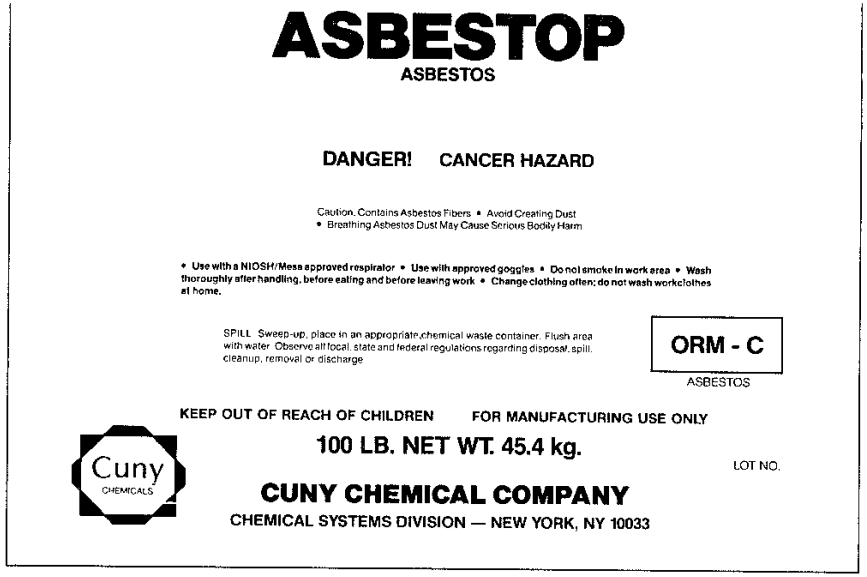
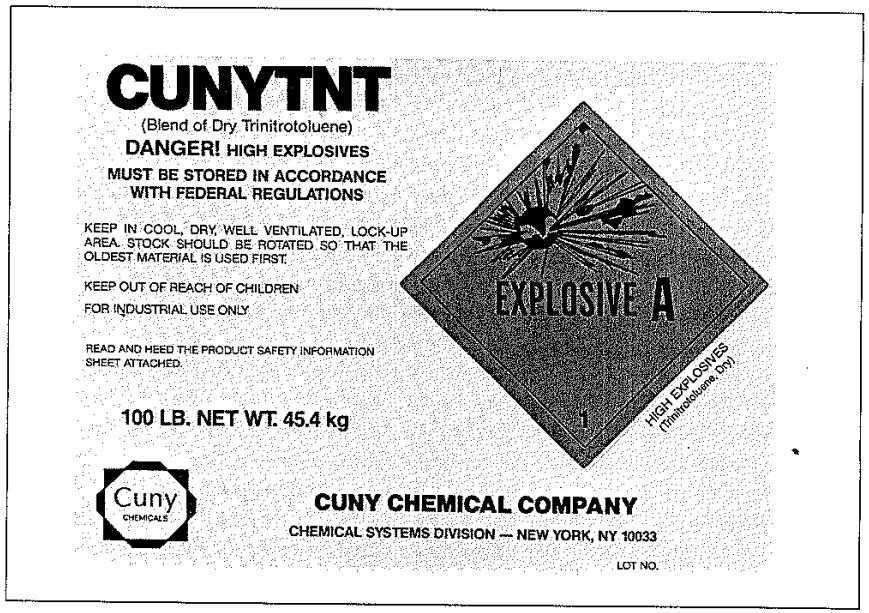


Figure 6.1 Chemical labels for the job risk study. *Top*: CARB.

Compensating Differentials and Workplace Safety





Compensating Differentials and Workplace Safety

SODIUM BICARBONATE. SPILL: Sweep-up, place in an appropriate chemical waste container…

CHLOROACETOPHENONE. WARNING! LACHRYMATOR—VAPOR AND DUST EXTREMELY IRRITATING. Do not breathe dust or vapor. Wear a self-contained breathing apparatus…

ASBESTOS. DANGER! CANCER HAZARD. Use with a NIOSH-Mesa approved respirator. Use with approved goggles…

TNT—(blend of dry Trinitrotoluene). DANGER! HIGH EXPLOSIVES. MUST BE STORED IN ACCORDANCE WITH FEDERAL REGULATIONS. KEEP IN COOL, DRY, WELL VENTILATED, LOCK-UP AREA…

Compensating Differentials and Workplace Safety

- Results from the Viscusi and O'Conner study
- Workers were shown the chemical labels, told they would be working with them
- Viscusi and O'Conner estimated how much workers demanded in a salary increase:
  - Sodium bicarbonate: \$0
  - Lachrymator: \$1,919
  - Asbestos: \$2,996
  - Trinitrotoluene: \$5,158

Compensating Differentials and Workplace Safety

Empirical estimates of risk premiums as a percentage of total earnings

Risk premiums of 3% to 5%	Petroleum refining
	Tobacco manufacturers
	Transportation equipment
Risk premiums of 6% to 9%	Textiles
	Rubber and plastics
	Leather and leather products
Risk premiums of 12%-15%	Food products
	Furniture and fixtures
	Lumber and wood products

Alternative Mechanisms for Achieving Safety

- There are two other big ways that workplace safety is regulated
- First is direct regulation of workplace conditions by OSHA
- The other major mechanism is workers' compensation
- These two approaches work in two very different ways and have very different benefits and drawbacks

OSHA and the Direct Regulation of Safety

The Occupational Safety and Health Act of 1970 was passed with the intention:

> *...to assure so far as possible every working man and woman in the Nation safe and healthful working conditions and to preserve our human resources.*

Note that this is a bit different than what we've been talking about with compensating differentials.

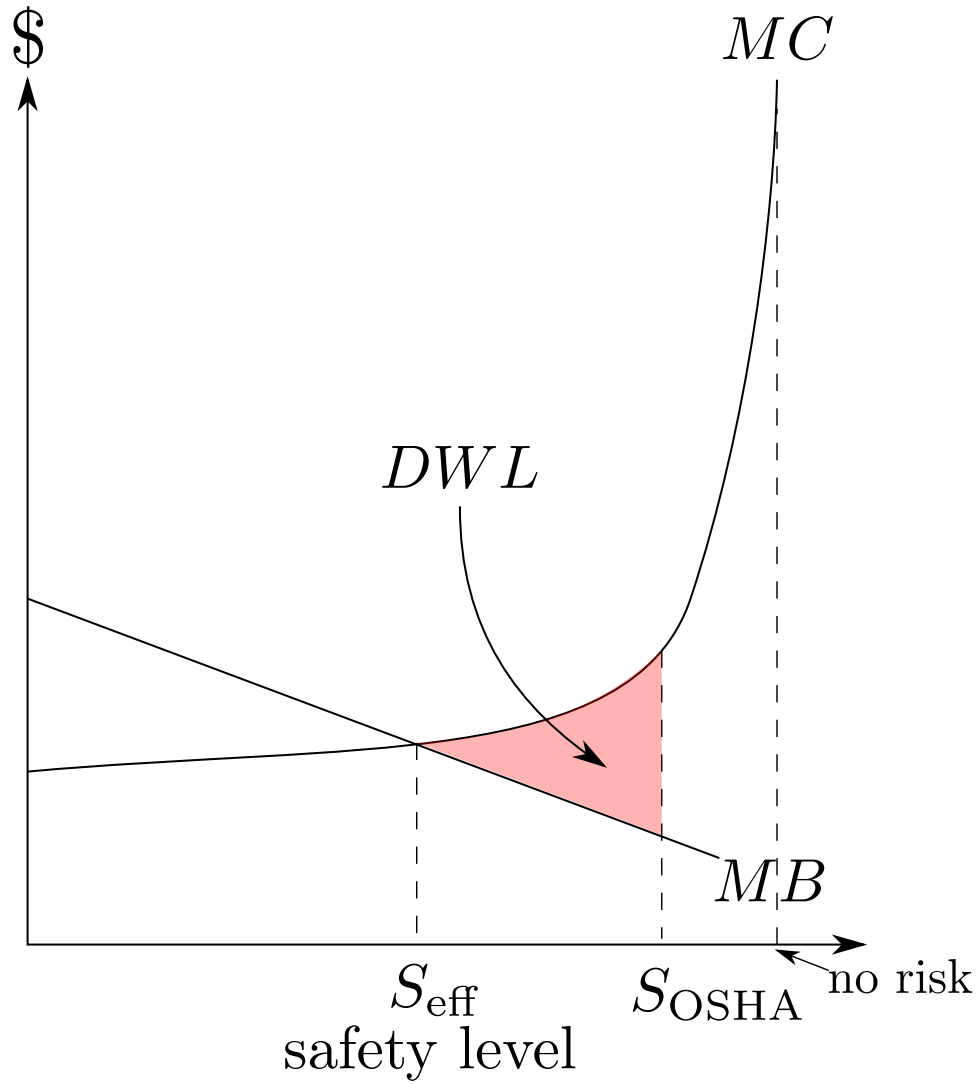
OSHA and the Direct Regulation of Safety

- OSHA requires certain safety standards and monitors for compliance
- Criticisms are that OSHA's regulations are inefficient and focused on things that are easily accomplished through compensating differentials
- Other criticisms are that OSHA has the wrong objective function
- Consider the language employer duties mandated by the act

OSHA and the Direct Regulation of Safety

Each employer shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees...29 U.S.C. 654, 5(a)

OSHA and the Direct Regulation of Safety



Cost-benefit Analysis of Reducing Risk

Costs of risk-reducing regulations per expected life saved

Regulation	Year	Cost per life saved (millions of 1995 dollars)	Cost per normalized life saved (millions of 1995 dollars)	Cost per year of life saved (millions of 1995 dollars)
Seat belt/air bag	1984	0.1	0.1	0.0
Underground construction standards	1989	0.1	0.1	0.0
Aircraft floor emergency lighting	1984	0.7	0.9	0.0
Children's sleepwear flammability ban	1973	1.0	1.2	0.1
Rear lap/shoulder belts for autos	1989	3.8	3.8	0.2
Asbestos occupational exposure limit	1972	9.9	24.7	1.2
Asbestos occupational exposure limit	1986	88.1	220.1	10.6
Hazardous waste land disposal ban	1988	4,988.7	12,462.7	597.4
Atrazine/alachlor in drinking water	1991	109,608.5	273,824.4	13,126.8

Workers' Compensation

- Other major mechanism is workers' compensation
- Requiring firms to insure against worker accidents gives them incentives to improve safety standards (to reduce premiums)
- So introducing workers' compensation programs should reduce accidents
- Empirically, researches find a positive correlation between workers' comp and nonfatal accidents
- What's going on? Maybe reporting, maybe moral hazard