Strategic Adjustment

Key Idea

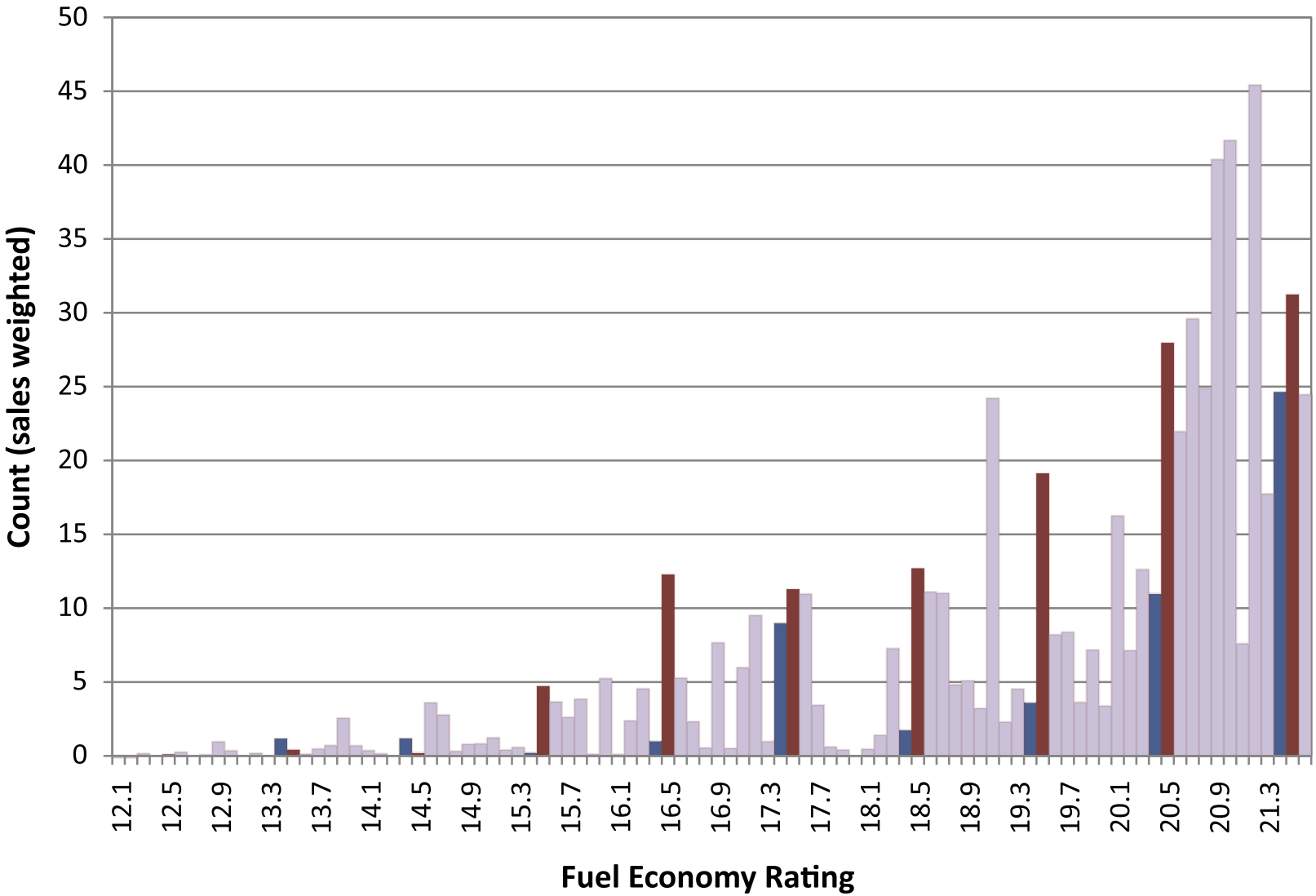
Actions "up the tree" affect actions "down the tree"

If fail to account for strategic response to policy change, implement ineffective or incorrect policy

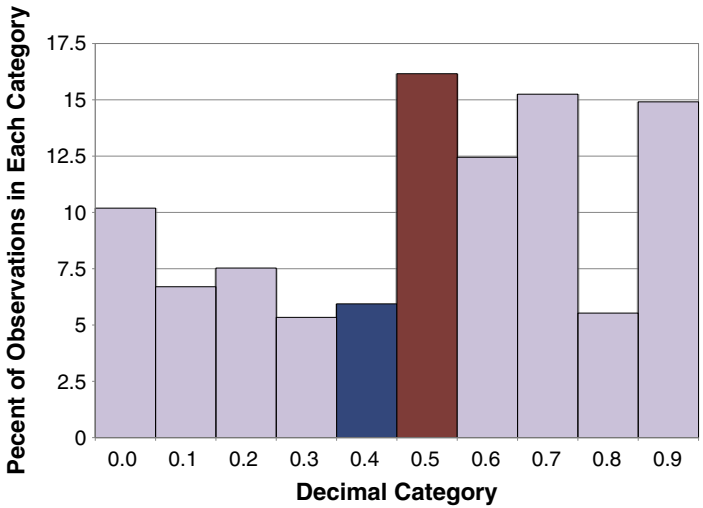
Have to anticipate adaptation when designing policy

This also makes it important to measure the right outcome

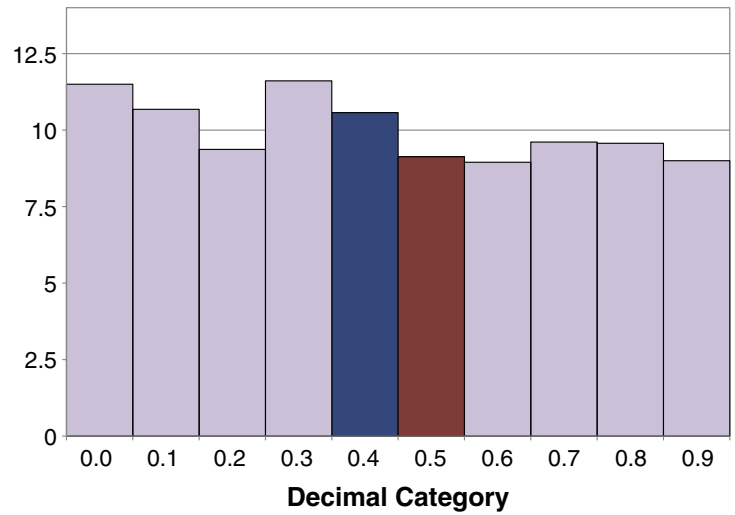
Car Notches 1



Car Notches 2



Subject to Tax



Not Subject to Tax

Baby Notches U.S.

Tax benefits to having child in December instead of January in U.S.

Many more children born in final week of December than first week of January

A $500 increase in tax benefit of having a child increases the probability a child is born in the last week of December rather than the first week of January by over 25%

Evidence of Strategic Adjustment: Baby Notches Australia

In May 2004 Australia announced a $3,000 "baby bonus" for children born on or after July 1, 2004

More children born on July 1, 2004 in Australia than on any other single day in decades

Over 1000 births delayed , with over two hundred of them moved by a week or more

In the last week of June, 42% of births through pharmaceutical induction or Cesarean

In the first week of July, 52%

Efficacy and Adaptation

People adapt to avoid policy

This limits efficacy and requires careful policy design

- Remember our discussion of college affordability earlier this year

Sometimes adaptation also creates opportunities

Educational Reform

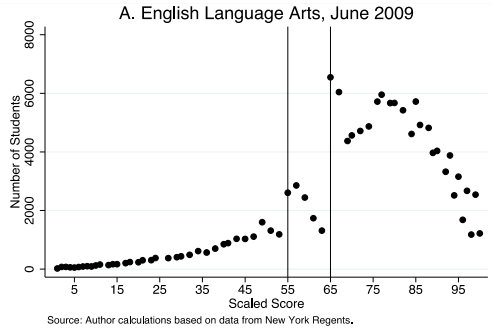
Hold students, teachers, and schools accountable by evaluating based on standardized test scores

- NCLB
- Race to the Top

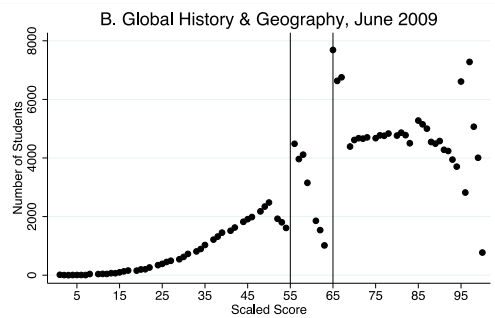
Adaptation to improved measurement and heightened incentives

- Get scores just above test thresholds
- Shift effort to test-relevant tasks
- Shift attention to students close to the test threshold

Test Thresholds



Source: Author calculations based on data from New York Regents.
Notes: Graph shows number of students attaining each scaled score.



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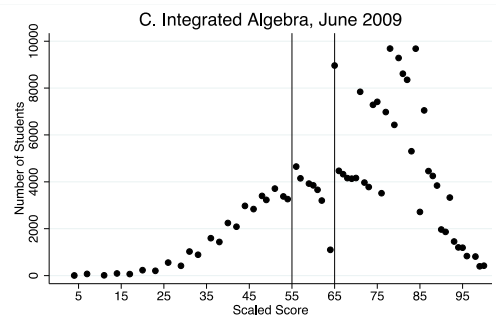

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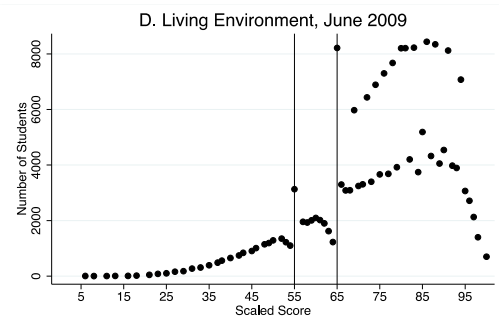

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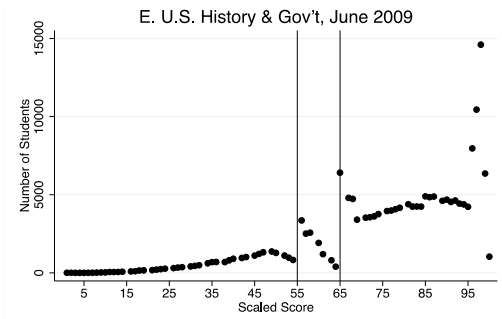

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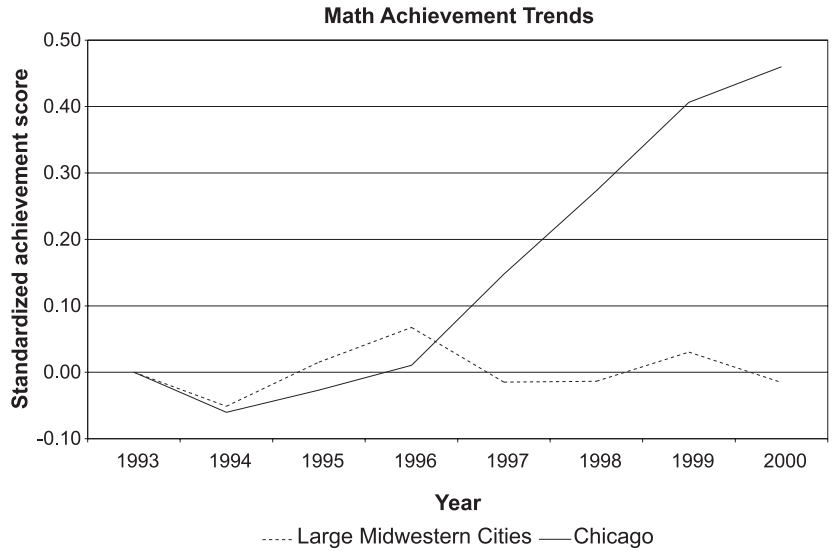
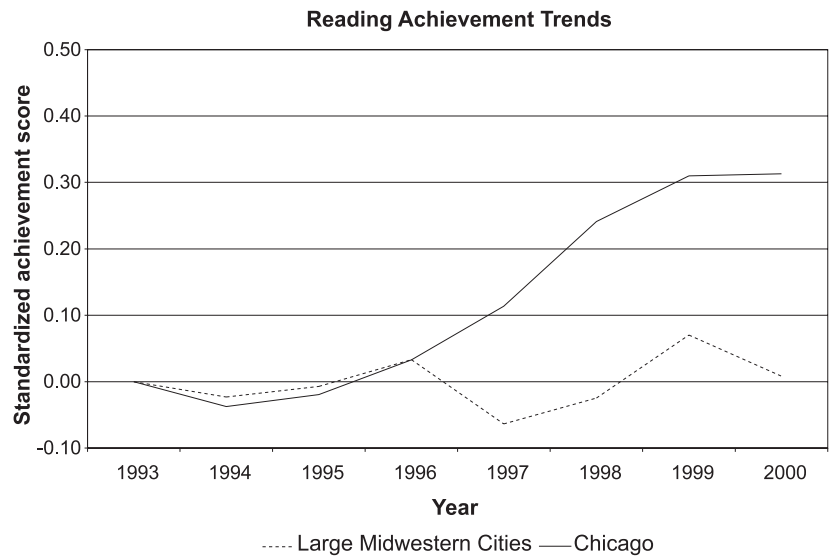
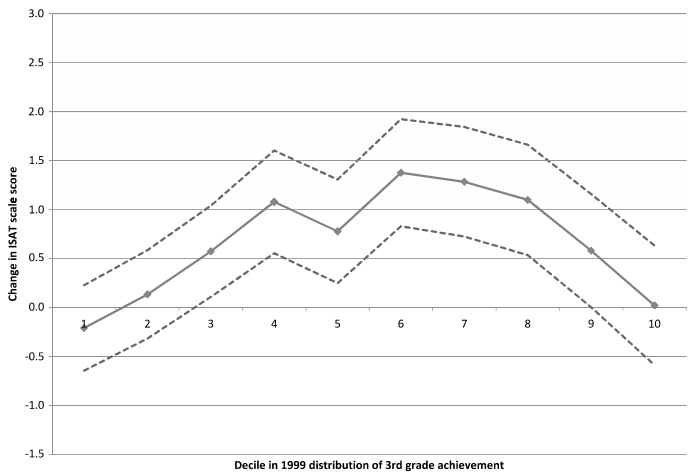
Topical Focus



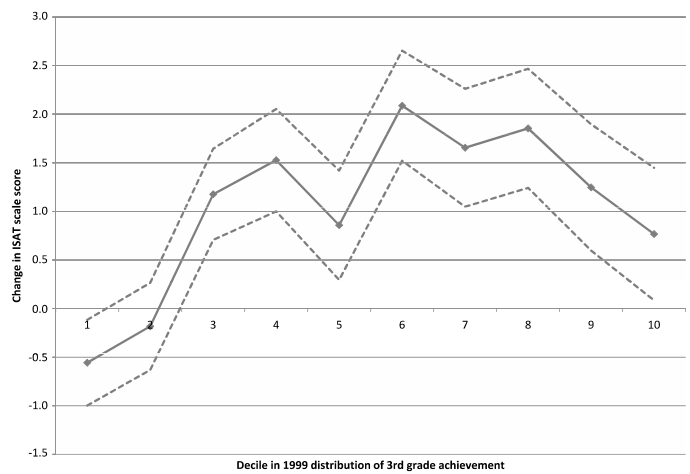


Teaching to the Marginal Student

A. Change in fifth-grade reading scores, 2002 versus 2001



B. Change in fifth-grade math scores, 2002 versus 2001



Description

4 Targets

Defender has 100 units to allocate across targets

- Call allocation to target i, x_i

Attacker observes allocations and chooses a target to attack

Probability of successful attack on target i is

$$100 - x_i$$

A Model of Optimal Counterterrorism

Two potential targets: A and B

$\alpha \in [0, 1]$ is government resources devoted to protecting A and $\beta \in [0, 1]$ is government resources devoted to defending B

- $\alpha + \beta = 1$

Terrorists choose to attack one or the other target.

If resources x spent protecting a given target, then the probability of an attack on that target succeeding is $1 - x$

Terrorists value two targets equally

Terrorist Best Response

If the the government chose $\alpha > \frac{1}{2}$, terrorists' best response is to attack target B

If government chose $\alpha < \frac{1}{2}$, terrorists' best response is to attack target A

If government chose $\alpha = \frac{1}{2}$, terrorists are indifferent between attacking A or B.

Optimal Counterterrorism

If the government expends more resources protecting one target than another, those resources are entirely wasted because the terrorists adjust, attacking the other target

The best the government can do is divide its resources evenly between two targets

Strategic adjustment by terrorists forces the government to spread resources thin

Implications 1

Optimal counterterrorism policy is not responsive to how much the government cares about the two targets

It is a mistake to particularly defend targets that are of high value to the government

Implications 2

Optimal counterterrorism policy *is* responsive to how much the terrorists care about the two targets

Suppose the value to the terrorists of the two targets is v_A and v_B. The terrorists strictly prefer to attack A if:

$$(1-\alpha)v_A > (1-\beta)v_B$$

$$\alpha < \frac{v_A}{v_A + v_B}.$$

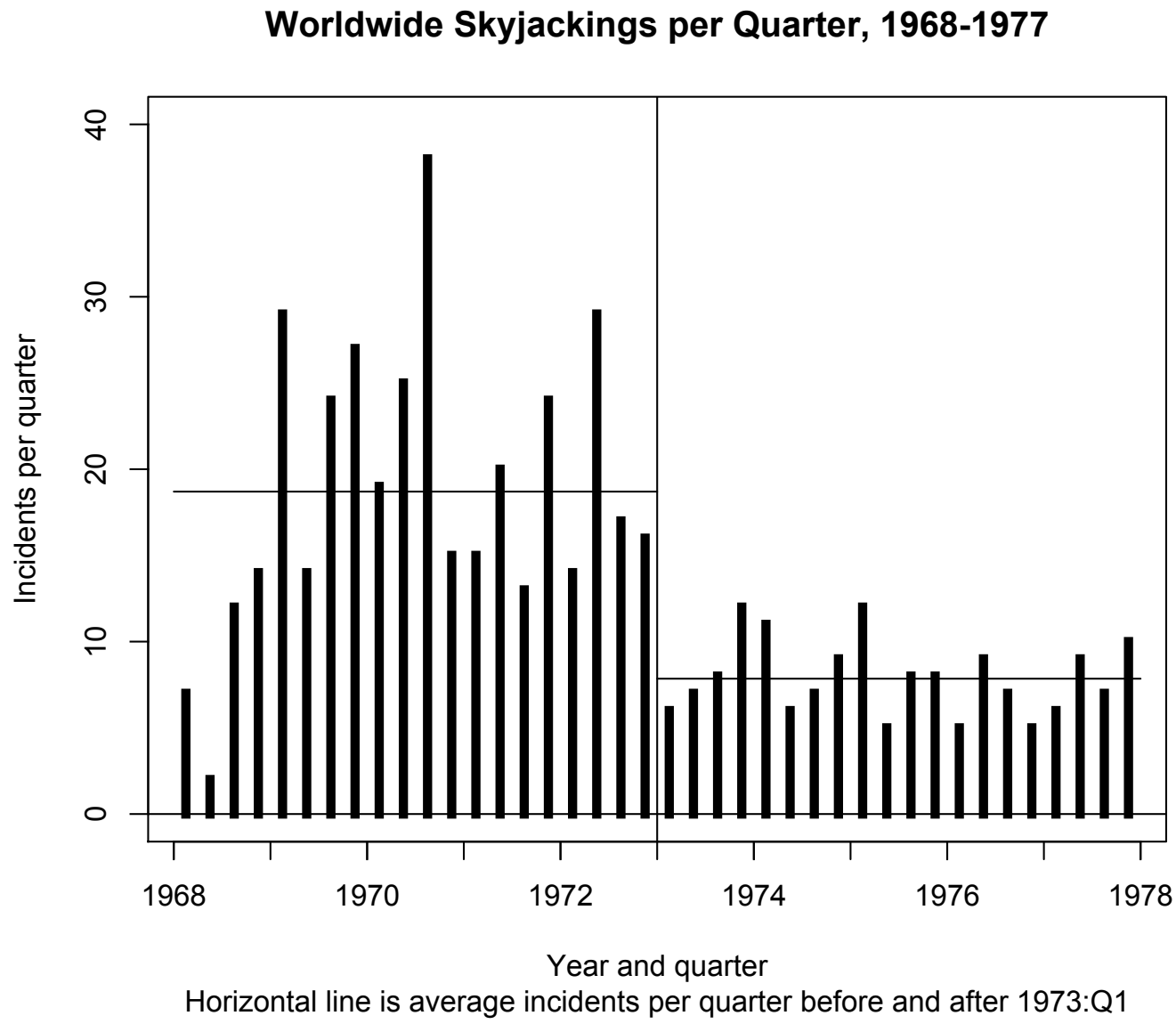
Government again spreads resources thin, but weighted by how much the terrorists care about each target to equalize expected value of attacking each target

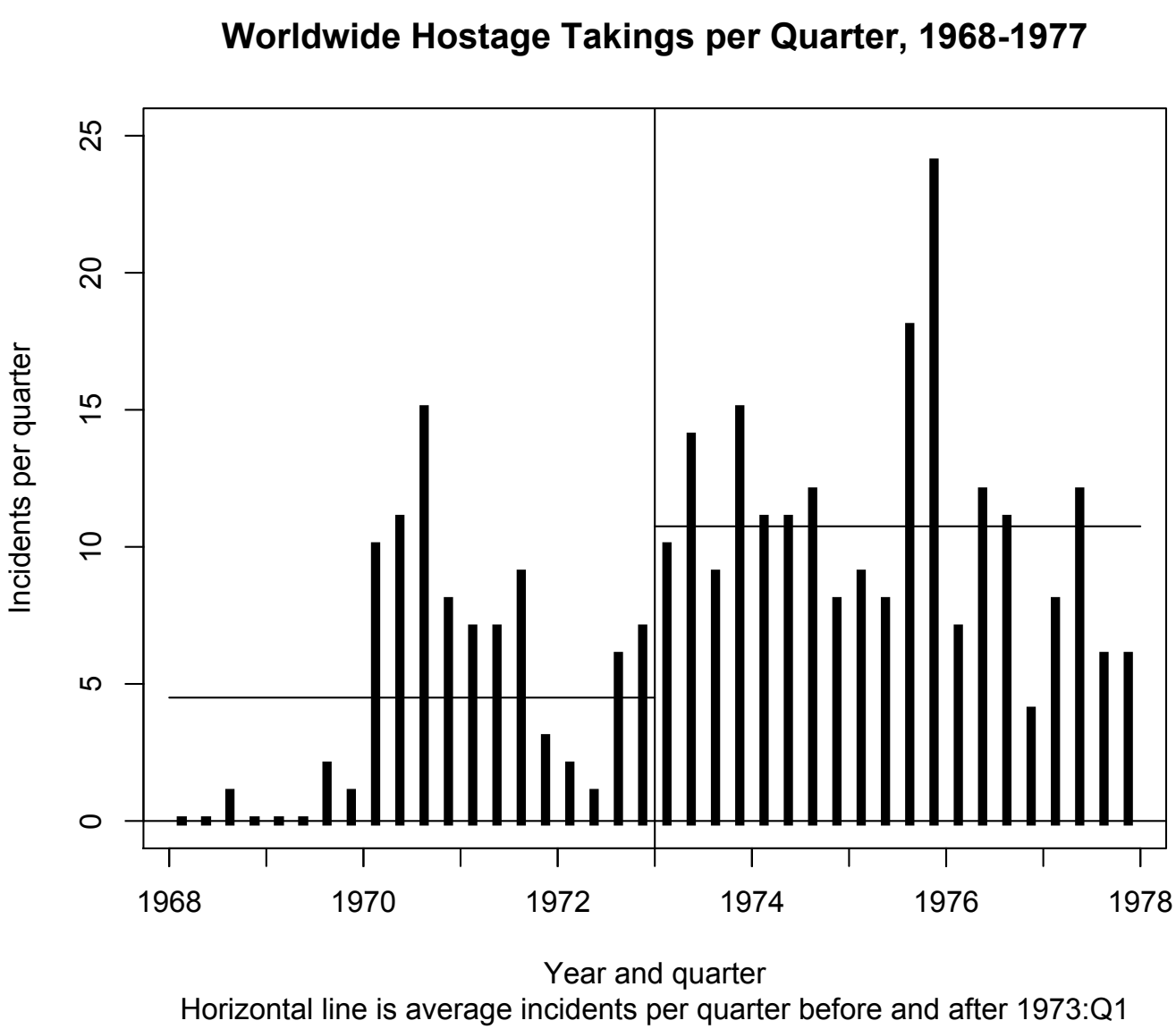
Implications 3

If there are lots of targets, the problem is even starker

Algorithm for optimal counterterrorism policy:

- Start by spending on the target considered most valuable by the terrorists
- Keep spending until its expected value as a target is equal to the second most valuable target
- Then spend on both of those until they are both equal to the third most valuable target
- Then spend on all three of those until they are all equal to the fourth most valuable target
- Continue this process until you are out of mone


Worldwide Skyjackings per Quarter, 1968-1977
Incidents per quarter
0
10
20
30
40
1968
1970
1972
1974
1976
1978
Year and quarter
Horizontal line is average incidents per quarter before and after 1973:Q1


Worldwide Hostage Takings per Quarter, 1968-1977
Incidents per quarter
0
5
10
15
20
25
1968
1970
1972
1974
1976
1978
Year and quarter
Horizontal line is average incidents per quarter before and after 1973:Q1

General Lessons

You have to think about the behavior of the people your policy is targeted at

Adaptation limits efficacy

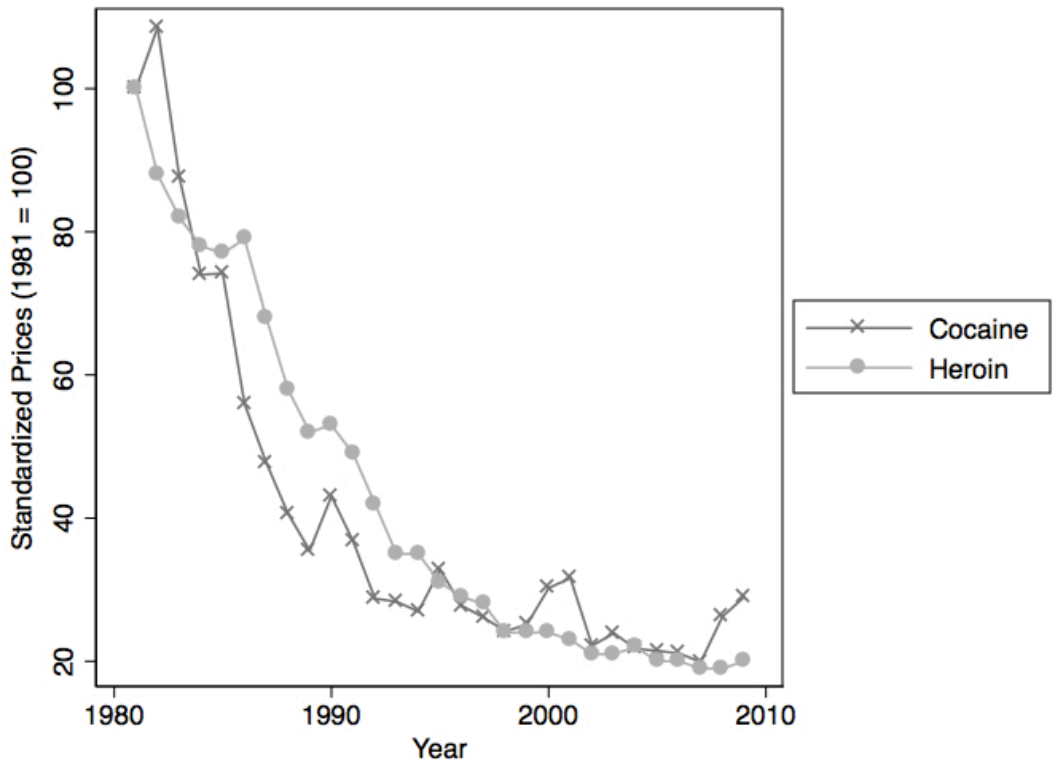
War on Drugs

Caribbean share

- 1985: 75%
- 1992: 10%

Mexican Share

- 1989: 33%
- 1992: 50%
- 1998: 80%



A Proposal for Ending Drug Violence in Mexico

6 major drug trafficking organizations

Mexican government crafts a public measure of how violent each organizations is

United States and Mexican governments target all drug enforcement resources on the single most violent organization

Only way to avoid being targeted is to not be most violent

- Creates a race to the bottom

Could eliminate violence, but would not disrupt drug trafficking

Take Aways

People adapt in response to policy changes

In order to anticipate the effect of a policy change, one must take into account how behavior will change

Nonetheless, adaptation limits the efficacy of policy

Try to find policies that target the broadest category of behavior your policy is aimed at

- Tax on carbon rather than implement CAFE standards
- Increase intelligence rather than airport security