New Directions in Tobacco Regulation and the Contributions of Economics

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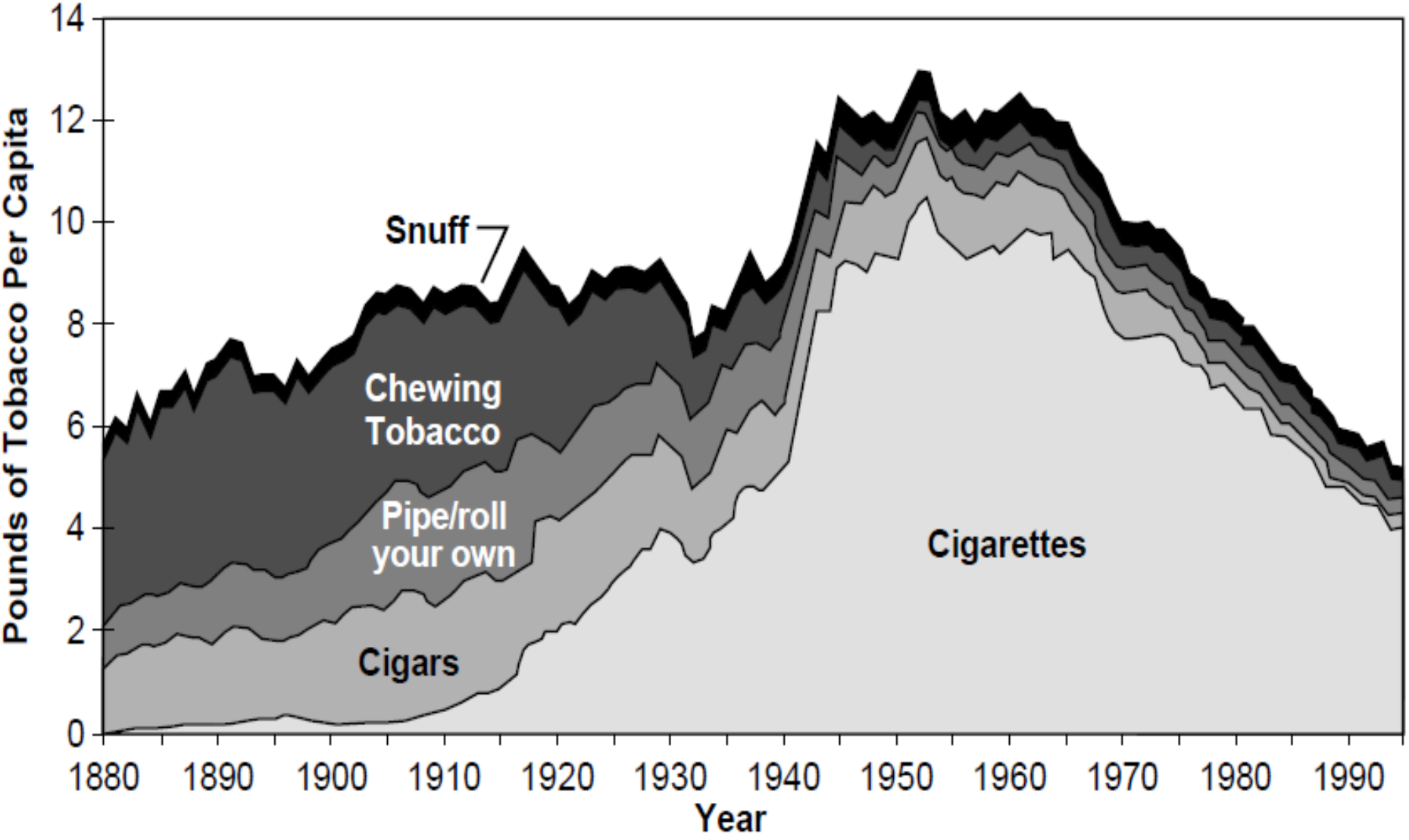
Outline

- Where are we and how did we get here?
- New directions in tobacco regulation
  - 2009 Tobacco Control Act
- Contributions of economics
  - Focus on market forces (supply & demand)
  - Econometric analysis of observational data
  - Cost-benefit analysis of policy impacts
- Implications for other addiction policies

Where are we and how did we get here?

- Modern manufacturing and advertising helped launch “The Cigarette Century”
- Around mid-century, research convincingly shows the health consequences of smoking
- Warner (2007) calls the drop in smoking since the 1950s “the developed world’s greatest public health achievement in the past half-century”
  - Unfortunately, progress still needed in many low- and middle-income countries

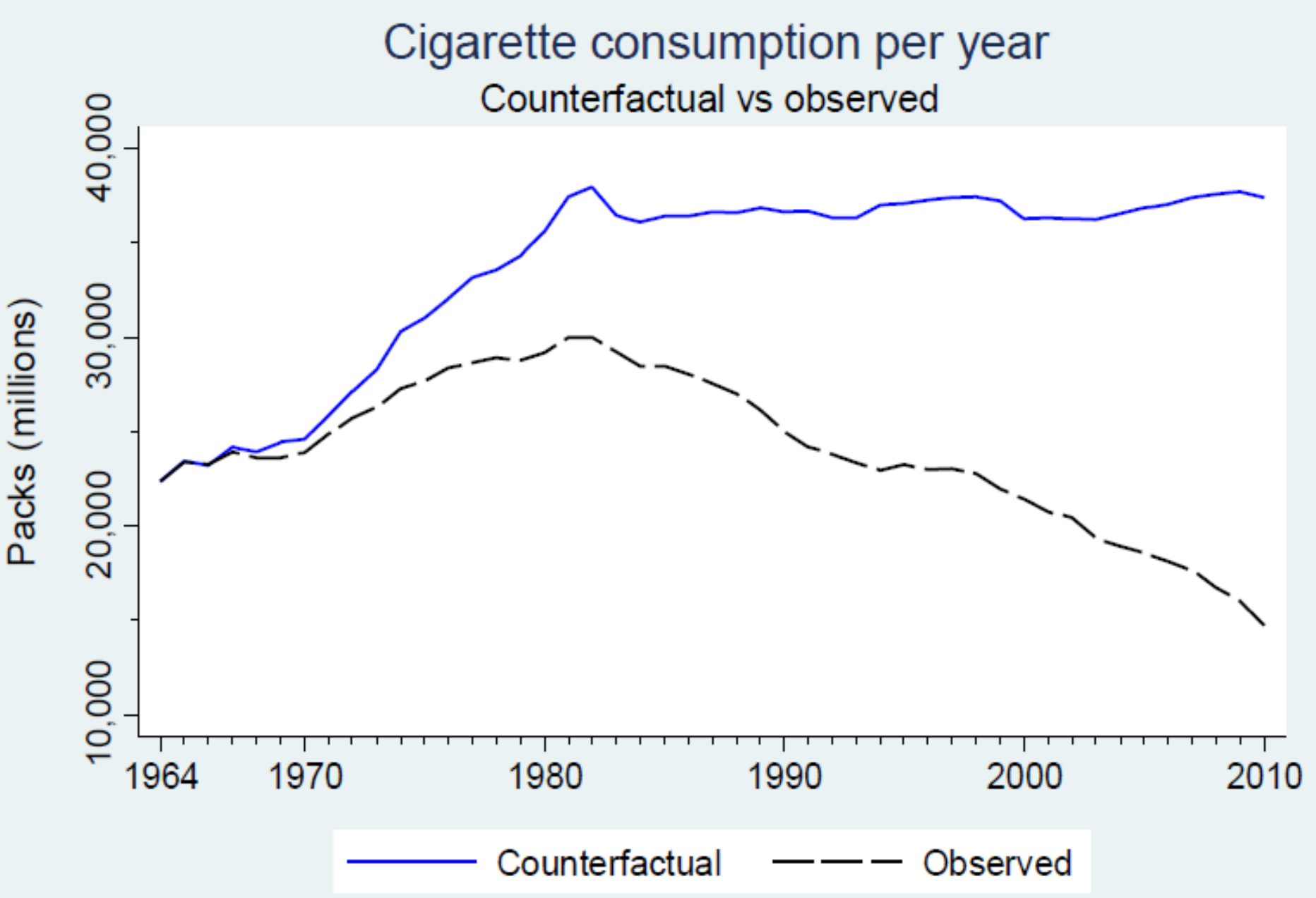
Per capita consumption of different forms of tobacco in the United States, 1880-1995



Source: U.S. Department of Agriculture, 1996.

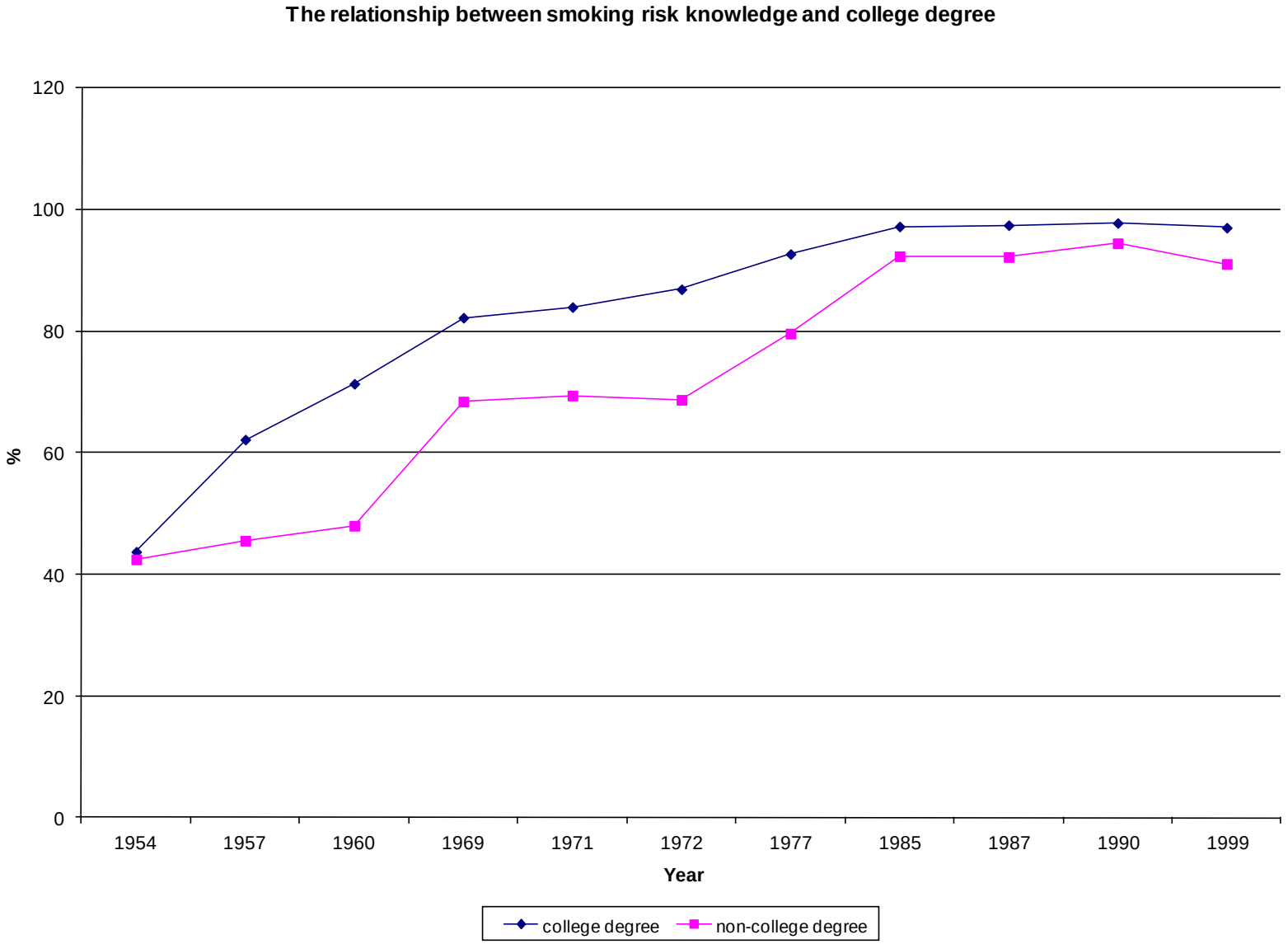
Retrospective Analysis of US Anti-Smoking Policies 1964 - 2010

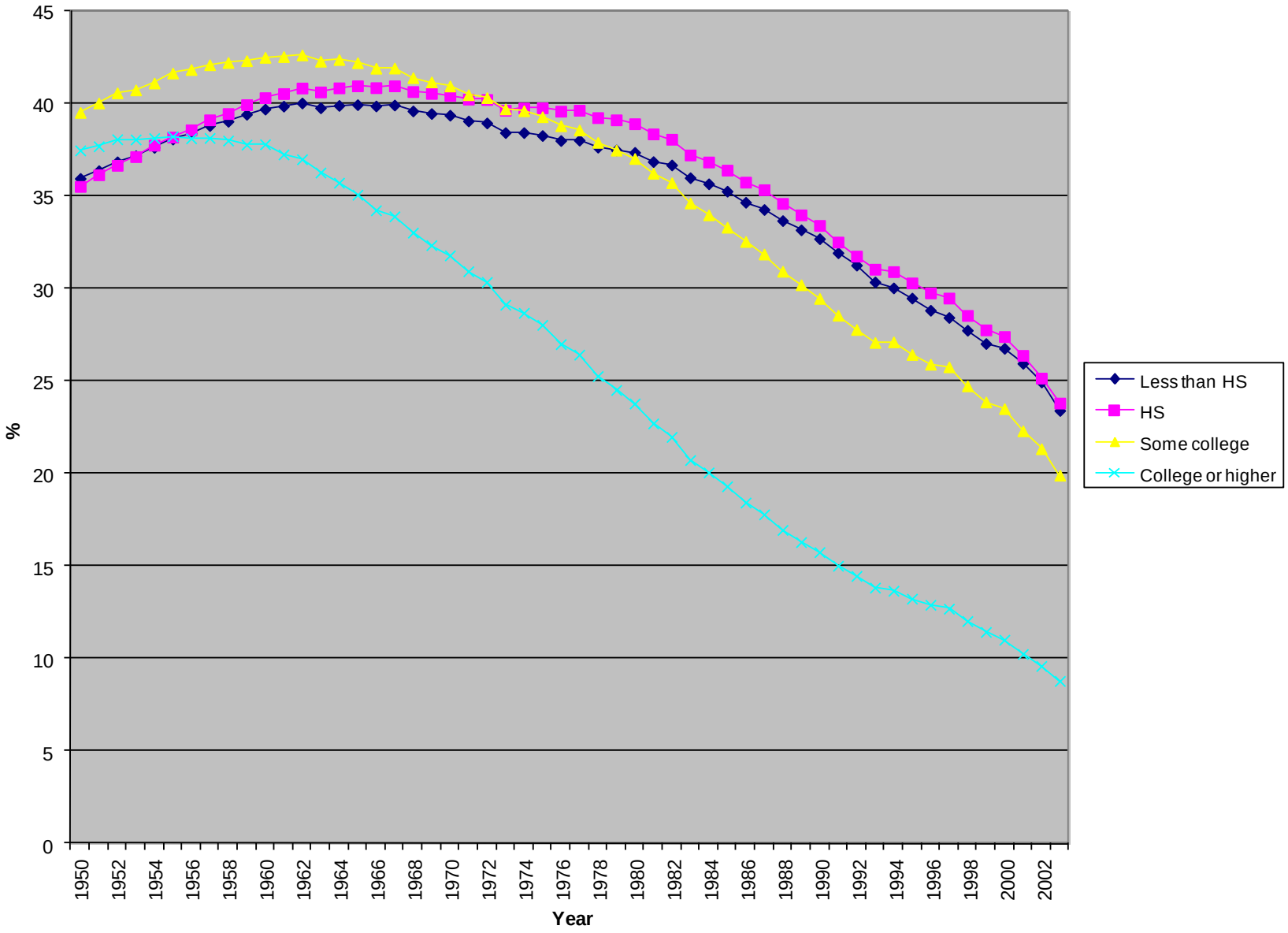
- Use dynamic population model to create a “no policy” counterfactual
- Simulations of smoking prevalence and cigarette demand over time
  - Estimate 1960 smoking population
  - Use standard data on birth rates
  - Mortality rates by smoking status
  - Fix smoking initiation & cessation rates at 1960 level
  - Estimate trend in cigarettes smoked per day based on aggregate sales and estimated # of smokers
  - Jin, Kenkel, Liu & Wang, *J of Benefit-Cost Analysis* 2015


Cigarette consumption per year
Counterfactual vs observed
Packs (millions)
10,000
20,000
30,000
40,000
1964
1970
1980
1990
2000
2010
Counterfactual
Observed
Data source: Simulations using TUS-CPS.

How did we get here?

- Information about health consequences played major role
  - Surgeon General Reports, warning labels, school health education, mass media campaigns, advertising bans, …
- After noting public health success, Warner also points out that the "the glass remains half empty."
  - Disparities related to schooling, income
  - In Deaton's book about the "Great Escape" from poverty, he notes that: "Escapes leave people behind, and luck … makes opportunities, but not everyone is equally equipped or determined to seize them. So the tale of progress is also the tale of inequality."


The relationship between smoking risk knowledge and college degree
120
100
80
60
40
20
0
%
1954
1957
1960
1969
1971
1972
1977
1985
1987
1990
1999
Year
college degree
non-college degree


Adult Smoking Prevalence over Time, from CPS-TUS 1992-2003, by Schooling
45
40
35
30
25
20
15
10
5
0
%
1950
1952
1954
1956
1958
1960
1962
1964
1966
1968
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
Year
Less than HS
HS
Some college
College or higher

New directions in tobacco regulation: 2009 Tobacco Control Act

- Gives the US FDA broad regulatory authority over tobacco
- Specific provisions
  - Requires graphic warning labels (already required in Canada, Australia, other countries)
  - Bans use of misleading terms such as “light”
  - Bans flavors in cigarettes other than menthol
- Possible regulations
  - Ban menthol (passed in EU, Brazil, a few other countries)
  - Reduce nicotine content (but not allowed to ban)
  - Extend tobacco regulations to electronic cigarettes

New directions & a new standard

- FDA uses **individual harm standard** to evaluate Rx drugs
- TCA requires **public health standard**: "The Secretary may by regulation require restrictions on the sale and distribution of a tobacco product … if the Secretary determines that such regulation would be appropriate for the protection of the public health….determined with respect to the risks and benefits to the population as a whole, including users and nonusers of the tobacco product, and taking into account--
- (A) the increased or decreased likelihood that existing users of tobacco products will stop using such products; and
- (B) the increased or decreased likelihood that those who do not use tobacco products will start using such products."

Contributions of economics (I): Focus on market forces

- Alternative perspectives on smoking
  - Addiction science
  - Social “epidemic”
- From perspective of economics, smoking results from decisions made by consumers & producers
  - Supply & Demand → price & quantity of cigarettes produced and consumed
  - Consumer demand for cigarettes
  - Industry supply of cigarettes
  - Interactions in markets

Consumer Demand for Cigarettes

- Health production function: H = H(Cigs, …)
- Utility: U = U (H, C, …)
  - Joint production: cigarettes are a direct source of utility but harm health
- FOC for utility-maximizing choice of prevention →

  marginal benefits = marginal costs

  $U_C / \lambda = p_C + | H_C \; U_H / \lambda |$

  = money price + health price
- See Grossman (1972, 2000) and extensions
- Becker and Murphy (1988) extend to addiction

Role of Consumer Information in Cigarette Demand

- Information → perceived marginal health product (H_C)

  → Better-informed consumers see higher health price
- Econometric evidence that "information shocks" (e.g. 1964 SGR) decrease smoking in US & other countries.
- Helps explain the difference between US smoking & European smoking: "The most important factor, however, appears to be differences in beliefs about the health consequences of smoking between the U.S. and Europe. Ninety-one percent of Americans think that cigarettes cause cancer; only 84 percent of Europeans share that view." (Cutler & Glaeser 2006, NBER wp 12124

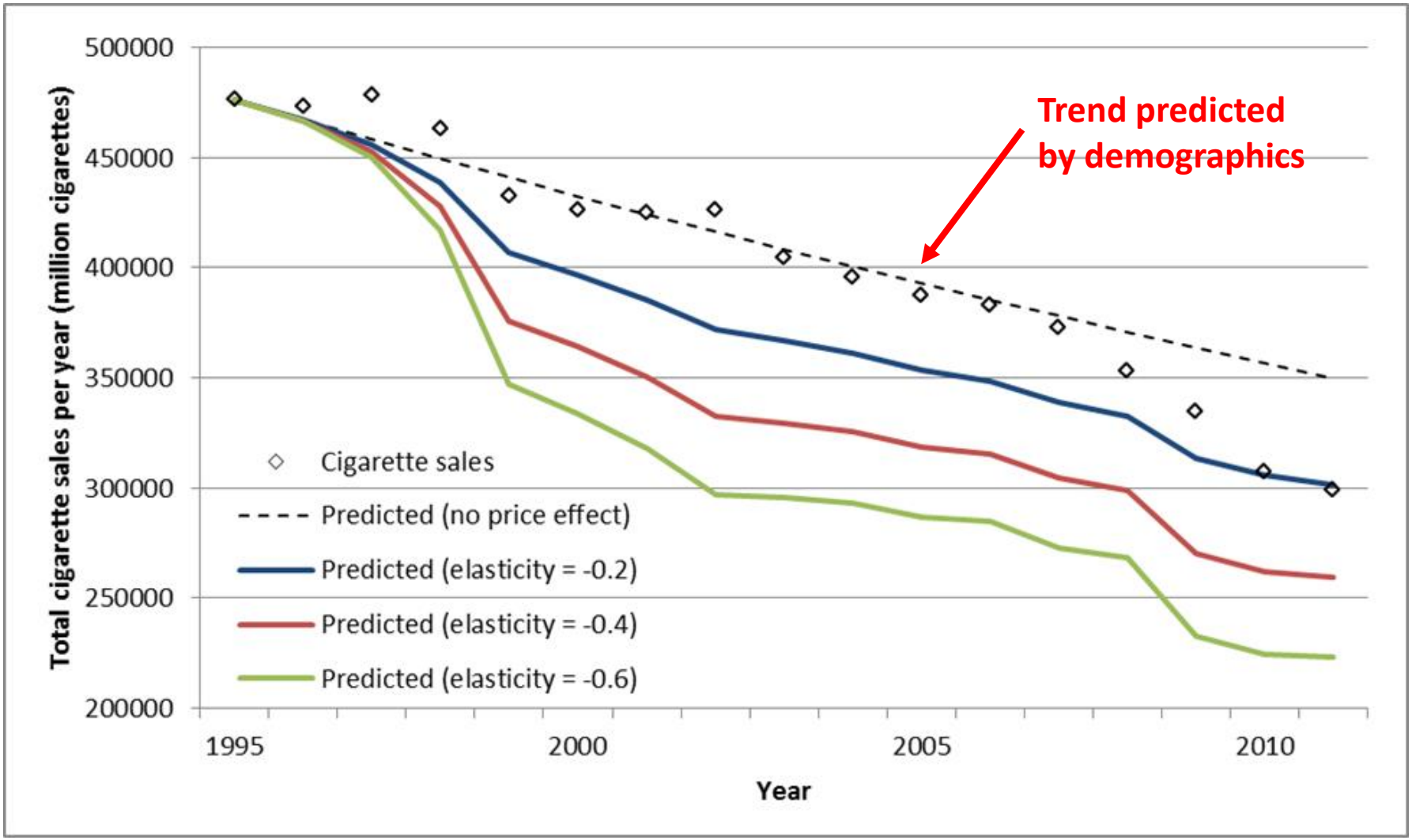
Wait, I thought economics was all about $ (taxes & prices)!

- Important contribution of economics: even addicted consumers will respond to higher prices
  - "First, increases in cigarette prices lead to significant reductions in cigarette smoking; most studies … predict that a 10-percent increase in price will reduce overall cigarette consumption by 3–5 percent....Most recent studies found that adolescents and young adults were two to three times more sensitive than adults to price.“ (2000 SGR)
  - SGR, WHO, other policy statements conclude: higher cigarette taxes to increase prices are a powerful tool to decrease smoking

Is the consensus carved in stone or crumbling to dust?

- "First, increases in cigarette prices can lead to substantial reductions in cigarette smoking. The consensus estimate from the two reviews is that a 10% increase in cigarette price will result in a 3–5% reduction in overall cigarettes consumed.... Third, much previous research on cigarette consumption among youth suggests that both youth and young adults are more responsive than adults to changes in cigarette prices, with several studies finding youth and young adults to be two to three times as responsive to changes in price as adults." (20**14** SGR).
- Accumulating research published btw 2000 & 2014: consensus estimate is probably too high
- Hard to reconcile trends & the consensus estimate (DeCicca & Kenkel, *Risk Analysis* 2015)

Demographics of smoking population explains almost all of the recent decline in smoking



1995-2010: price increased from $2.57 to $5.55 per pack

Large health price → small money-price elasticity isn't surprising

- Empirical estimates of health price = $|H_C U_H / \lambda|$ range from $20 to over $200 per pack
  - Gruber and Koszegi (2001), Cutler (2002), Sloan, et al (2004) and Viscusi and Hersh (2008), Cutler, Jessup & Starr (in progress)
- At current money prices in US, at most money price is 20% of the full price, perhaps 2.5% or lower
- If elasticity w.r.t money price = -1/2 → elasticity of demand w.r.t. full price at least -2.5, might be -20 or larger
- If health price = $200 and Europeans see 7% lower health price → perceived full price of cigarettes in Europe is $14/ pack lower (more than offsets their higher taxes)

Consumer incentives matter

- Health incentives matter a lot: help explain the "most successful public health endeavor" of the past half-century
  - Effect is through information: ↑ perceived health price
- Taxes might matter, but probably pale in comparison to information-based policies
- This lesson from tobacco control is relevant for taxing any health-related good

Market forces to lower the health price of smoking

- Powerful consumer incentives to be healthier

→ Powerful profit-incentives to develop healthier cigarettes

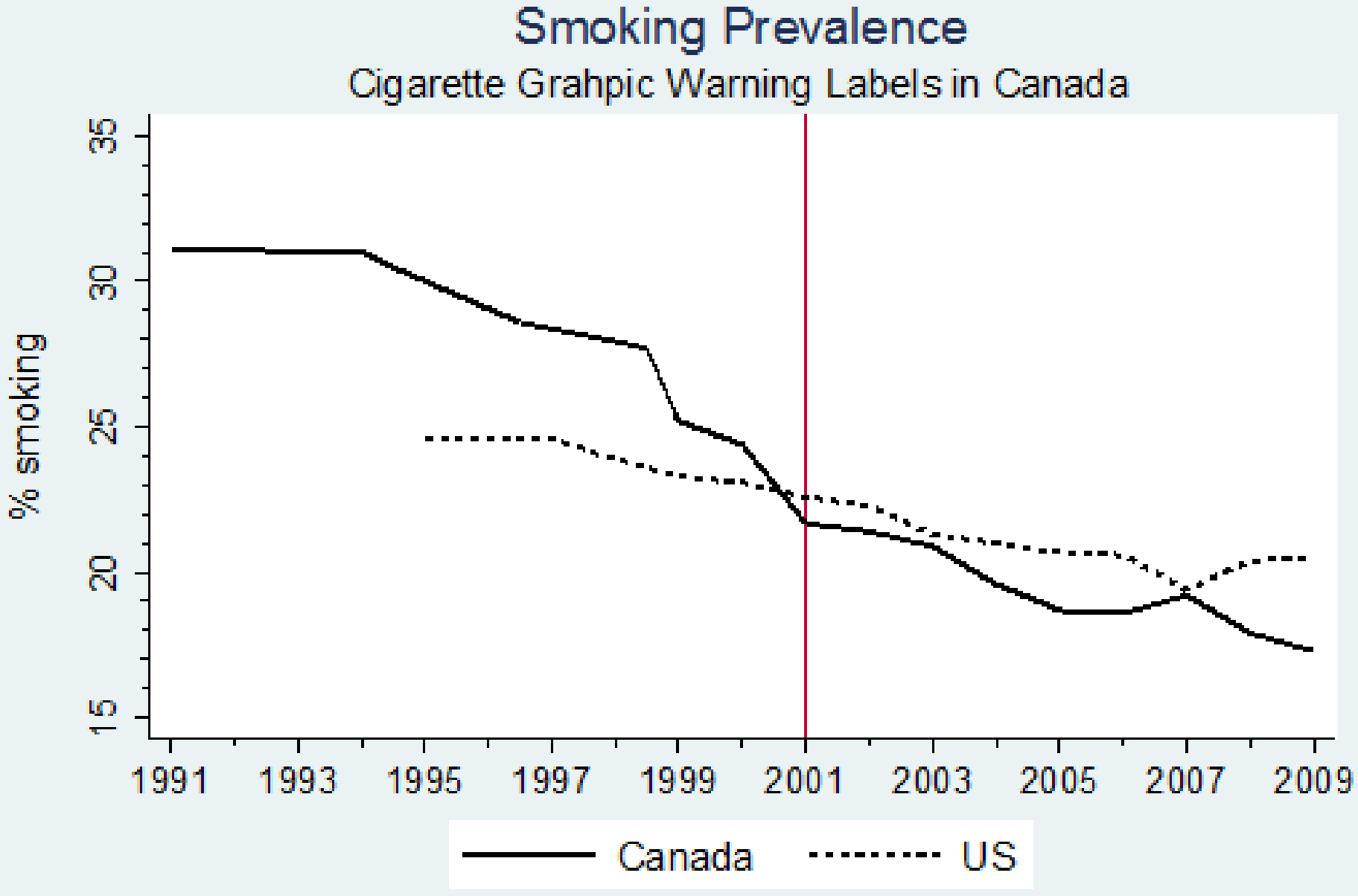
- Innovations in cigarette design widely adopted
  - Share of filtered cigarettes ↑ from 58% in 1963 to 99.8% in 2011 (FTC Cigarette Report)
  - Share of cigarettes with machine-read tar content of 15 mg or less ↑ from 2% in 1967 to 94.7% in 2011 (FTC Cig Report)
- Innovations didn't work to keep the cig market healthy
  - Didn't reduce health risks enough
  - Cig consumption continued to fall
- E-cigarettes and other vaping products are the most recent, and arguably most radical, product innovations

Contributions of Economics (II): Econometrics & observational data

- Public health standard for new tobacco regulations
  - Impact on users (cutting down, quitting)
  - Impact on nonusers (initiation)
- Evidence base needs social science research/ observ data
- Limited role for bench science, RCTs
  - Need for new analytical chemistry?
  - RCTs often impractical and/or unethical
  - Limited external validity
- 4 examples: 1) graphic warning labels, 2) banning menthol, 3) regulating e-cigarettes, 4) very low nicotine cigarettes

Example 1: Graphic warning labels

- 2009 TCA requires FDA to develop, implement new GWLs
- Experimental evidence: FDA chose labels partly based on an "emotional reaction scale … such as 'depressed,' 'discouraged,' and 'afraid'…"
- Difference-in-difference study to evaluate impact on market
  - Before-and-after study of Canada's adoption of GWLs
  - U.S. as control group
- U.S. Court of Appeals for DC (RJR et al. v FDA, 2012): "FDA has not provided a shred of evidence—much less the "substantial evidence" required by the APA—showing that the graphic warnings will "directly advance" its interest in reducing the number of Americans who smoke."


Smoking Prevalence
Cigarette Grahpic Warning Labels in Canada
% smoking
35
30
25
20
15
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
Canada
US
Data: Huang et al. (2014) Tobacco Control.

Example #2: Banning menthol

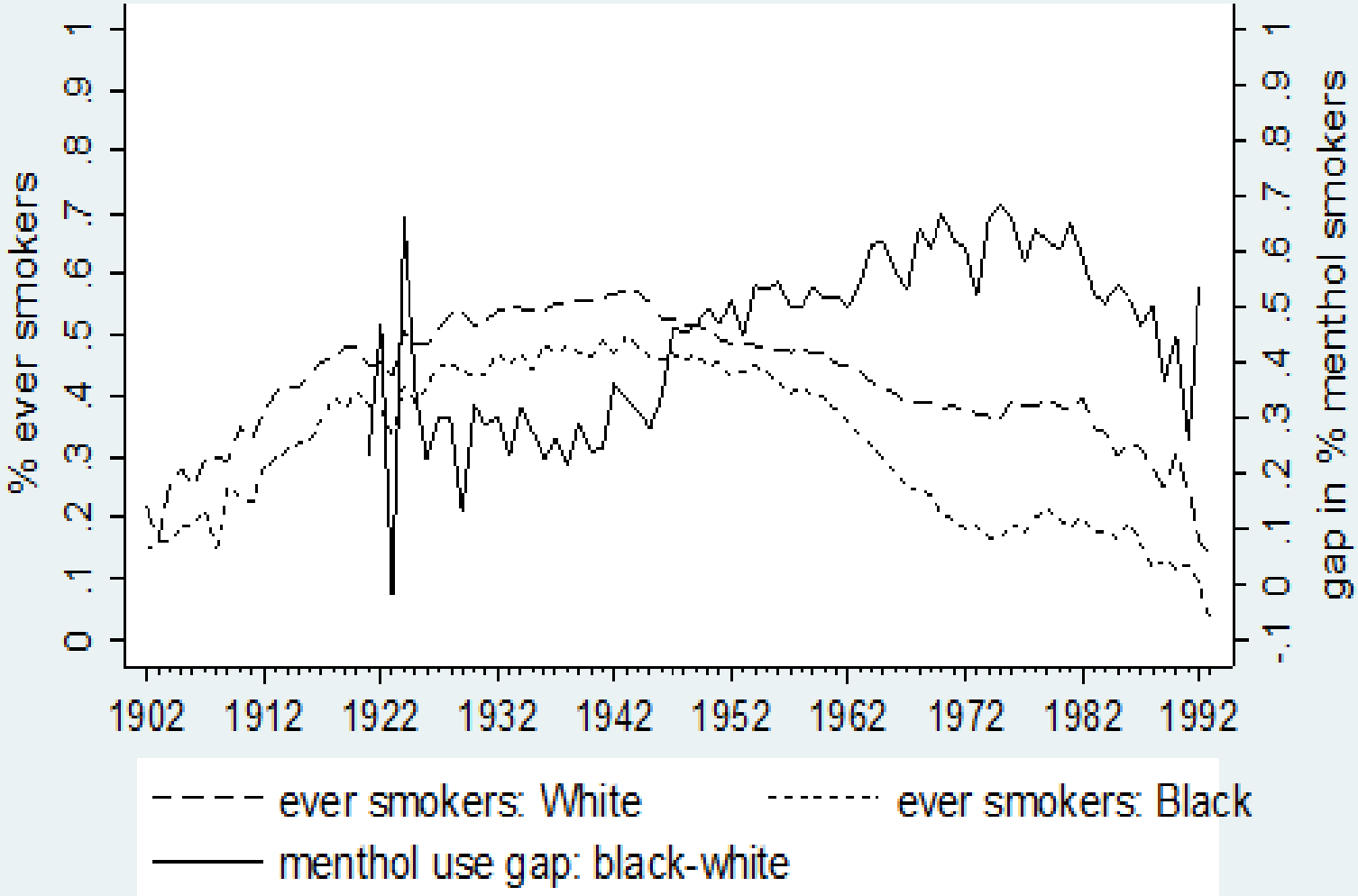
- **"Removal of menthol cigarettes from the marketplace would benefit public health in the United States."** (TPSAC, 2011)
  - Menthol not harmful, but ↑ initiation and ↓ cessation
- Econometric treatment effect (Rubin causal model)
  - $O_{it} = \alpha\ Menthol_{it} + \beta\ X_{it} + \varepsilon_{it}$
  - Want to know the potential outcome of current menthol smokers, in counter-factual world w/out menthol
  - TE = actual outcome – potential outcome
  - Diff in observed outcomes = TE + self-selection bias term
  - (Unethical) RCT could solve the selection problem: randomly assign smokers to menthols or non-menthols, compare outcomes

Identification of the causal TE of menthol

- Menthol use: 74% Black smokers, 21% white smokers
  - Very strong cohort effects in Black menthol use
- Results + history of industry → patterns of menthol use reflect self-selection based on perceived & advertised image of menthol among some groups of consumers
  - Part of image is unrelated to health concerns
- Identification strategy for quasi-experimental analysis
  - Race*cohort interactions
  - Supply-side instrumental variables
  - Reduced-form and IV models
- DeCicca, Kenkel & Liu (2014) *De Gustibus Est Disputandum*

Figure. Ever smoking & menthol smoking by birth cohorts

White vs. Black



Data: CPS-TUS

Example #3: Regulating e-cigarettes

- “People smoke for the nicotine but die from the tar.”
  - Tar is by-product of tobacco combustion
  - People can vape for the nicotine and avoid the tar.
- Proposed “deeming regulation:” vaping products “deemed” to be tobacco products under FDA regulatory authority
  - Required warning label
  - If not “substantially equivalent” to predicate product, required to demonstrate that new product protects public health (“Premarket Tobacco Application”)
- Future regulations
  - Ban flavors in vaping products?
  - Modified Risk Tobacco Product???

Evidence base for regulating vaping

- Crafting regulations does not require resolving all scientific uncertainty about the safety of vaping products
  - No doubt that vaping is much, much safer than smoking
- The hard questions are social science research questions
  - Will vaping be a gateway to teen smoking?
  - Will dual use discourage or encourage quitting?
  - How might regs change answers to these questions?
- Discrete choice experiments: explore smokers' choices in hypothetical markets
  - Predict demand under regulatory scenarios
  - External validity: combine with observed market data

Example #4: Very low nicotine cigarettes

- "Of all the end game proposals, nicotine reduction is the one that appears to have created the most interest within the U.S. scientific and policy research communities…" 2014 SGR, p. 854
- Bench science: developed very low nicotine tobacco
- RCTs: estimate impact on individual smokers
  - Smokers randomized into group receiving progressively lower nicotine cigarettes: no reduction in smoking at end of 7 month intervention or at 12-month follow-up (Benowitz et al, *Addiction* October 2015)
- How would smokers & markets respond to nicotine regulation?
  - IOM Report on the illicit tobacco market

Contributions of Economics (III): Cost-Benefit Analysis of Tobacco Regulation

- CBA is a general tool to guide policies
  - Are resources in their most highly valued use?
- CBA is part of OMB-required Regulatory Impact Analysis
  - FDA completed controversial CBAs of graphic warning label rule, deeming regulation
- CBA
  - Identify market failure(s) and individual failures (internalities)
  - Predict impact
  - Estimate costs & benefits

CBA quantifies tradeoffs involved in tobacco regulation

- Example: Product regulations such as menthol ban
  - Tradeoff: Improving public health vs. creating illicit market
  - Revenues from contraband cigarettes have funded organized crime, even terrorism
  - Well-established CBA methods for crime & justice policy
- Example: regulations that discourage use of vaping products
  - Tradeoff: youth initiation vs. adult cessation

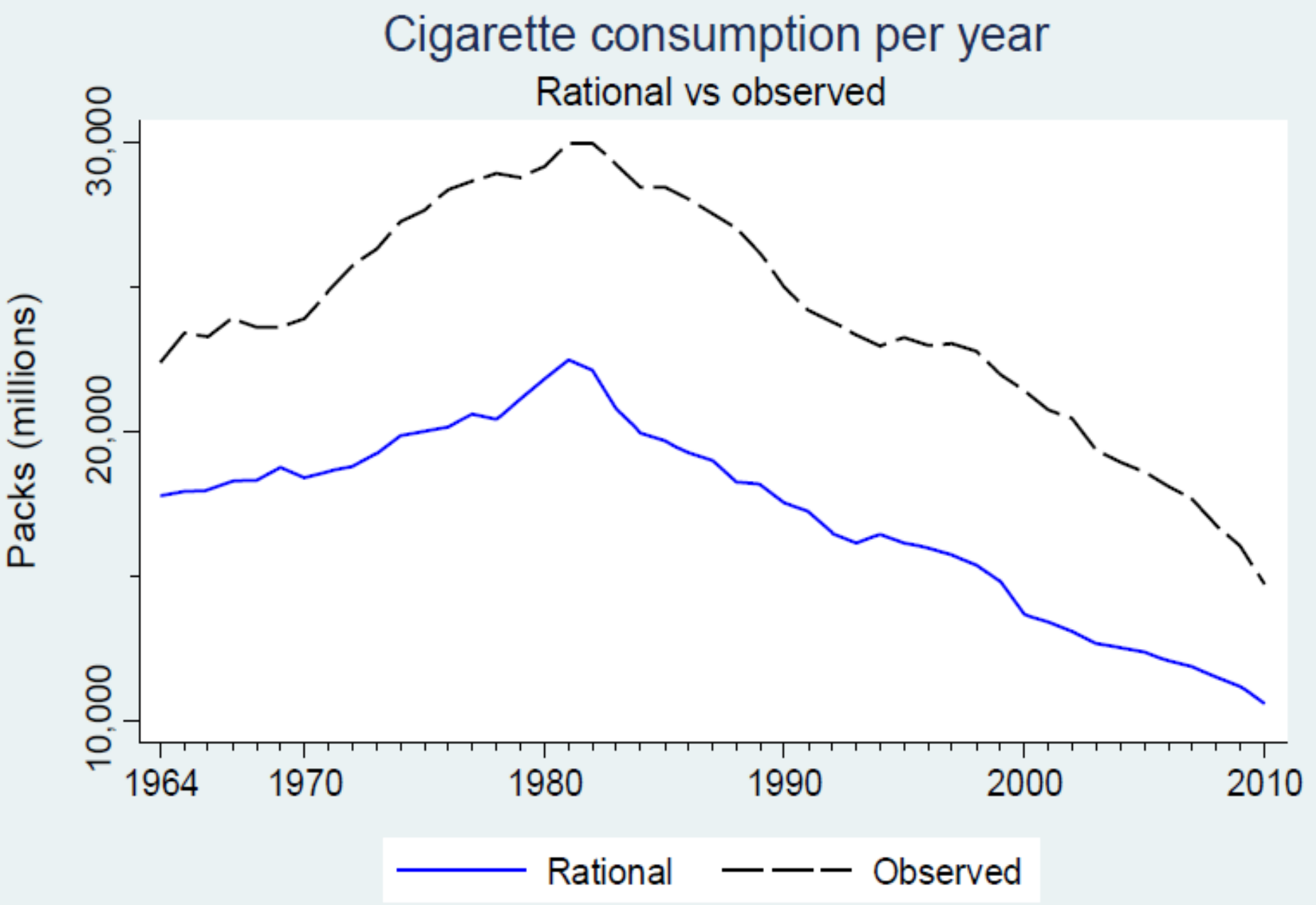
  ↔Tradeoff: lives saved in the far- vs. near-future
  - Well-established CBA methods for calculating present value of future costs, lives

CBA of tobacco regulation won't be easy

- **Doctrine of revealed preference** fundamental to CBA:
  - "…we infer what people want from what they choose. When evaluating policies, we attempt to act as each individual's proxy, extrapolating his or her likely policy choices from observed consumption choices in related situations." Bernheim and Rangel, NBER WP 11518, 2005.
- **Internalities**: Rationale for tobacco regulation often based on argument that smokers make choices contrary to their own best interest
- **How do we relax the doctrine of revealed preference?**
  - "If we can classify, say, the consumption of an addictive substance as contrary to an individual's interests, what about choices involving literature, religion, or sexual orientation?"

Market-based Approach with Internalities

- Define compensating variation in income for tobacco regulation in terms of experienced utility
  - Experienced utility depends upon true health costs
  - Decision utility might not fully incorporate health costs
- CV measured as an area of consumer surplus
  - Observed market demand might not reflect opt decisions
  - Rational demand curve incorporates full health costs
    - Also reflects addictive stock (withdrawal costs)
  - Distance between demand curves = marginal internality
- CV = change in cig consumption x marginal internality
  - Consistent with approach in Chetty (2011)


Cigarette consumption per year
Rational vs observed
Packs (millions)
10,000
20,000
30,000
1964
1970
1980
1990
2000
2010
Rational
Observed
Data source: Simulations using TUS-CPS.

Retrospective & prospective CBAs

- Retrospective: 1964-present value of the consumer benefits from anti-smoking policies through 2010 = $573 bill.
  - Benefits > Costs
  - Back-of-the-envelope estimates imply that 94% of the gross health benefits from past policies are offset by losses on consumer surplus
- Prospective: 2010-present value of consumer benefits 30 years into future from simulated FDA tobacco regulation = $100 bill
  - Potential FDA regulations impose substantial costs
  - Less clear if Benefits > Costs


DOONESBURY
By Garry Trudeau
HI, KIDS! YOUR OL' PAL MR. BUTTS HERE, AND BOY, DO I HAVE NEWS!
9-14
GET THIS!
"IN A COST-BENEFIT ANALYSIS, THE FDA SAYS THE PLEASURE OF SMOKING OFFSETS THE COSTS BY 70%."
HALLELUJAH! ABOUT TIME!
THE FDA IS FINALLY ADMITTING THAT THE PLEASURE OF ADDICTION IS A BENEFIT!
A BENEFIT WHICH DISCOUNTS THE "COSTS" OF SMOKING - ALL THOSE PAINFUL, EARLY DEATHS - BY 70%!
Universal Uclick ©2014 G.B. Trudeau
www.doonesbury.com
70%? WHY, THAT'S ALMOST A WASH!
Thank You for Smoking!
SO LIGHT UP TODAY, KIDS, AND ENJOY THOSE BENEFITS!
YOU'LL ONLY BE 30% SORRY YOU DID!

Implications for other addiction policies

- Economics contributes more than estimates of the price-elasticity of demand for addictive goods
- Market forces
  - Strong consumer incentives for health
  - Strong incentives from addiction
    - Can't ignore withdrawal costs
  - Suppliers will try to provide what consumers want
- Econometric analysis of observational data
- CBA