Synthesizing Econometric Evidence: The Case of Price Elasticity Estimates

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Outline

- Criteria for selecting among research synthesis methods
- Usefulness of price-elasticity as a summary measure
- Comparing methods to synthesize econometric evidence on price-elasticities
- Discussion: policy implications & research needs

Econometric evidence is used to make broad brush policy recommendations

- "Substantial increases in the excise taxes on cigarettes would have a considerable impact on the prevalence of smoking and, in the long term, reduce the adverse health effects caused by tobacco." (2000 Surgeon General Report)

- "One of the most effective strategies for reducing consumption of alcohol at the population level is through increasing alcohol prices, usually accomplished by raising alcohol taxes." (WHO 2011)
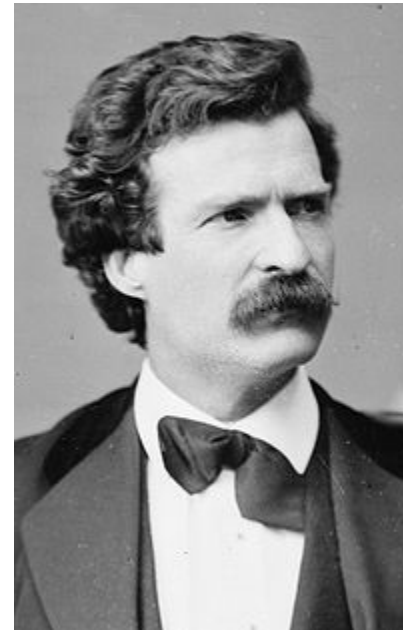
Criteria to guide the broad brush:

- Synthesis method should provide evidence about the unbiased cause-and-effect relationship between price and consumer demand
  - Strong research design/ internal validity
- Synthesis method should provide evidence about the magnitude and practical significance of the relationship
  - Statistical precision necessary but not sufficient

"It ain't so much the things we don't know that get us into trouble. It's the things we know that just ain't so."

- Attributed to Artemus Ward, American humorist, 1834-1867

ARTEMUS WARD

- (Probably not Mark Twain, 1835-1910)
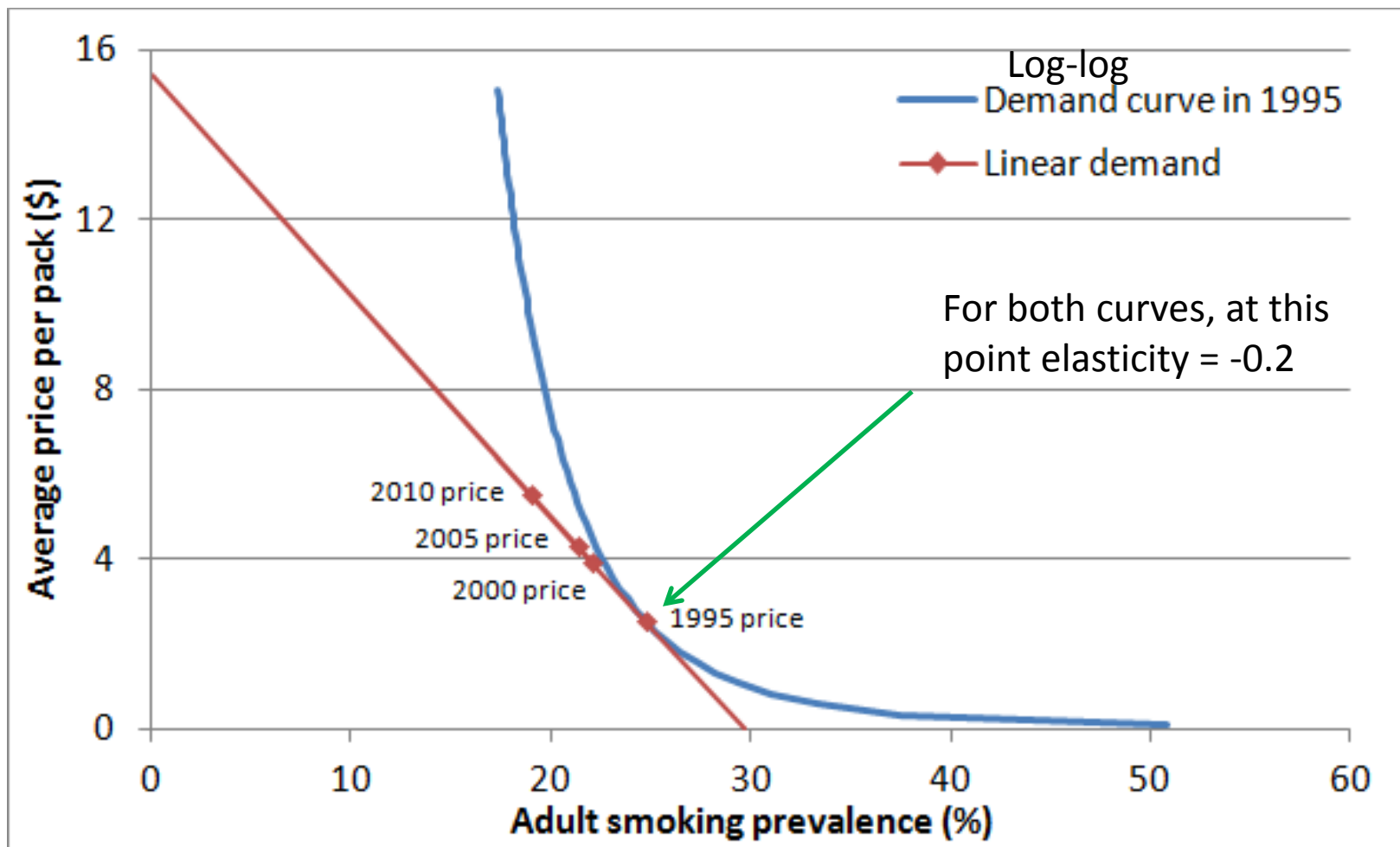
Usefulness of Price-Elasticity as a Summary Measure

- Slope of demand curve shows the price-responsiveness of consumer demand
- Price-elasticity normalizes slope in percentage terms

  η = % change in demand/ % change in price

  Example: if η = - 0.5, a 10% change in price is predicted to cause demand to drop by 5%
- Elasticities at different margins
  - Elasticity of participation (any use)
  - Elasticity of demand conditional on use
  - Elasticities of initiation and cessation of use of addictive goods

Some Price-elasticity Estimates

- Meta-analysis of 523 estimates from 86 studies:

  Price-elasticity of demand for cigarettes = - ½

  (Gallet and List 2003)

- Meta-analysis of 1003 estimates from 112 studies:

  Price-elasticity of demand for alcohol = - ½

  (Wagenaar, Salois and Komro 2009)

- Under certain conditions theory predicts:

  All compensated price-elasticities = - ½

  (Clements 2008)

- Meta-analysis of 462 estimates from 42 studies:

  Price-elasticity of demand for illegal drugs = - 0.33!

  (Gallet 2013)

Advantages & disadvantages of η

- Normalization in % terms often useful to judge policy significance of the magnitude
  - Example: If η = -0.01, is a 100% change in price that reduces demand by 1% policy relevant?
- Normalization sometimes misleading
  - Does the importance of the change really depend on the size of the base?
- Functional form of the "dose-response" relationship between demand and price (axes reversed)

Identifying the cause-and-effect relationship between price and demand

- Key characteristic of problem & data: Econometricians use observational data
  - (Psychologists conducting "behavioral economics" research run experiments with smokers)
- Rely on quasi-experiments to identify cause-and-effect relationship between consumer demand & price
  - Aggregate time-series data: quasi-experiments are the year-to-year differences
  - State cross-sections: quasi-experiments are the cross-state differences
  - These aren't credible if these differences are correlated with other hard-to-observe determinants of consumer demand

Research Synthesis & the Credibility Revolution in Empirical Economics

- "… a hallmark of contemporary applied microeconometrics is a conceptual framework that highlights specific sources of variation. These studies can be said to be *design based* in that they give the research design underlying any sort of study the attention it would command in a real experiment….The best of today's design-based studies make a strong institutional case, backed up with empirical evidence, for the variation thought to generate a useful natural experiment." (Angrist & Pischke *JEP* Spring 2010)

- Existing meta-analyses and narrative reviews of estimates of the price-responsiveness of health-related consumption fail to discuss this aspect of research design
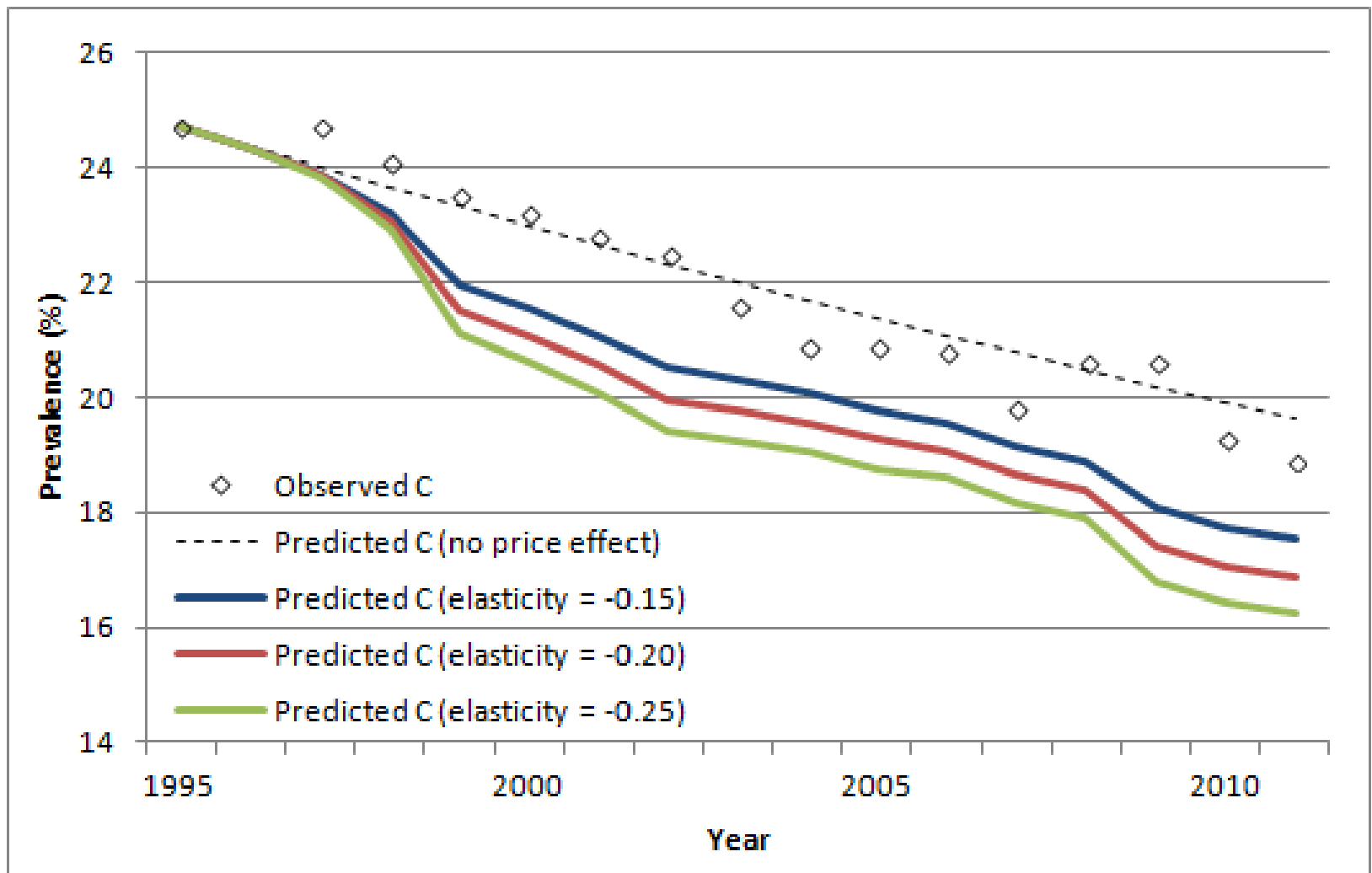
Cautionary tale about the consensus on cigarette price-elasticities

- Validation exercise
  - How well does the consensus estimate of ε predict trends in US smoking since 1995?
- Demographic trends predicted (almost exactly!) drop in smoking from 1995 – 2010 (Mendez and Warner *Am J Epi* 1998, Warner and Mendez *AJPH* 2012)
- Adjusted for inflation, avg price of cigarettes in the US more than doubled, from $2.57 to $5.55/ pack
- If consensus η correct $\rightarrow$ we should have seen much larger drop in smoking by now
- Perhaps consensus is wrong $\rightarrow$ casts doubt on narrative reviews and meta-analysis

TABLE 1—Actual and Projected Adult Cigarette Smoking Prevalence: United States, 2005 and 2010

Source	Model Calibrated Through	Initial Year of Projection	2005, %	2010, %
Actual prevalence: National Health Interview Survey[3]	. . .	. . .	20.9	19.3
Projected prevalence				
Méndez and Warner,[4] assuming continuation of 30% initiation rate	1995	2000	20.9	19.9
Méndez and Warner,[4] assuming initiation rate declines from 30% to 15% from 2000 to 2010	1995	2000	20.5	18.4
Méndez and Warner[6]	2005	2006	. . .	19.1

Source: Mendez & Warner *AJPH* 2012

Discussion: Comparing Research Synthesis Methods

- Criterion 1: Research design adequate to identify cause-and-effect relationship?
  - Neither narrative reviews nor meta-analysis (to date)
  - Narrative review: discussion of subtle issues
  - Meta-analysis: systematic, perhaps avoid reviewer bias
- Criterion 2: Magnitude and practical significance?
  - Neither narrative review nor meta-analysis allow mapping out demand curve (dose-response relationship)
- Implications for policy analysis
  - Perhaps there is less there (in the econometric evidence to date) than meets the eye

Discussion: Research Needs

- Work-in-progress: Updating meta-analysis of recent research on cigarette demand
  - Include credibility of research design as study characteristic
  - Focus on policy-relevant effect sizes, not just the price-elasticity as a summary measure
- Demonstrate feasibility for other meta-analyses