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Measuring Advances in Equity: Use of Distributional Weighting

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Context and Challenge

- Proving the intuitive:
  - "A dollar means less to a rich person"
- Economists spend a lot of time on this.
  - They're not great at it
  - They're better at "all else being equal"
- Related: Polices/regulations often emphasize efficiency and cost effectiveness
  - Equity measurement requires different methods, starting points
- Possible answer: **equity weighting**

Presentation Overview

- Philosophical discussion
  - How standard cost-benefit analysis weights results
- Nerdy economics for a few minutes
  - Atkinson, utility, and how wealth and happiness are related
- Equity weighting tool
  - How California Energy Commission can examine equity
- Communications and next steps

Equity in Economics: Current Use of Weights

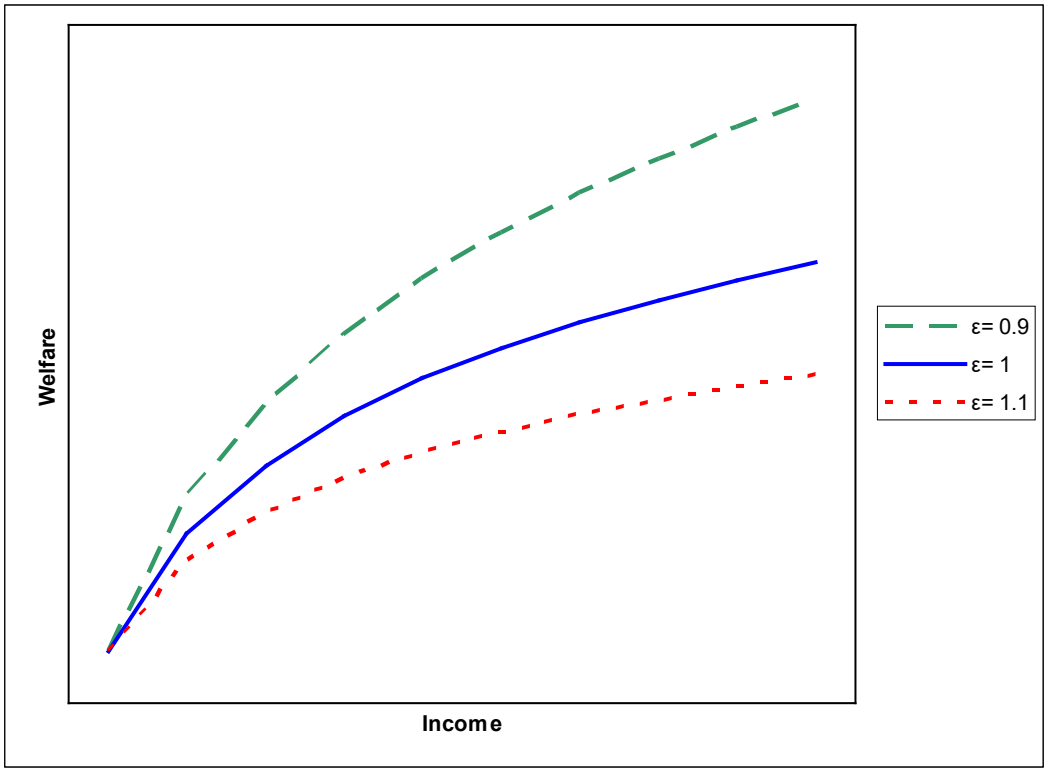
- Myth: Standard cost-benefit analysis does not use weights to differentiate the impact of costs and benefits on different people.
  - Fact: Standard CBA applies an explicit weight of "0"
  - Reason: The Kaldor-Hicks criterion underlies standard CBA. This that a policy is worthwhile if those who benefit **are able to** compensate those who do not.
- What does this mean?

  A policy/program where one person benefits and all others incur costs is efficient as long as the "winner" can *theoretically* transfer those benefits to others.

  Emphasizes "equality" but eliminates consideration of equity.

  Also – not intuitive. Even economists agree.

Atkinson Parameter and Index



Welfare as a Function of Income for different values of ε. *Source:* Adapted from Atkinson 1970.

- Atkinson examined relationship between wealth and income
- A single element ε determines the curve
- Defined ε as "inequality aversion.
- Function

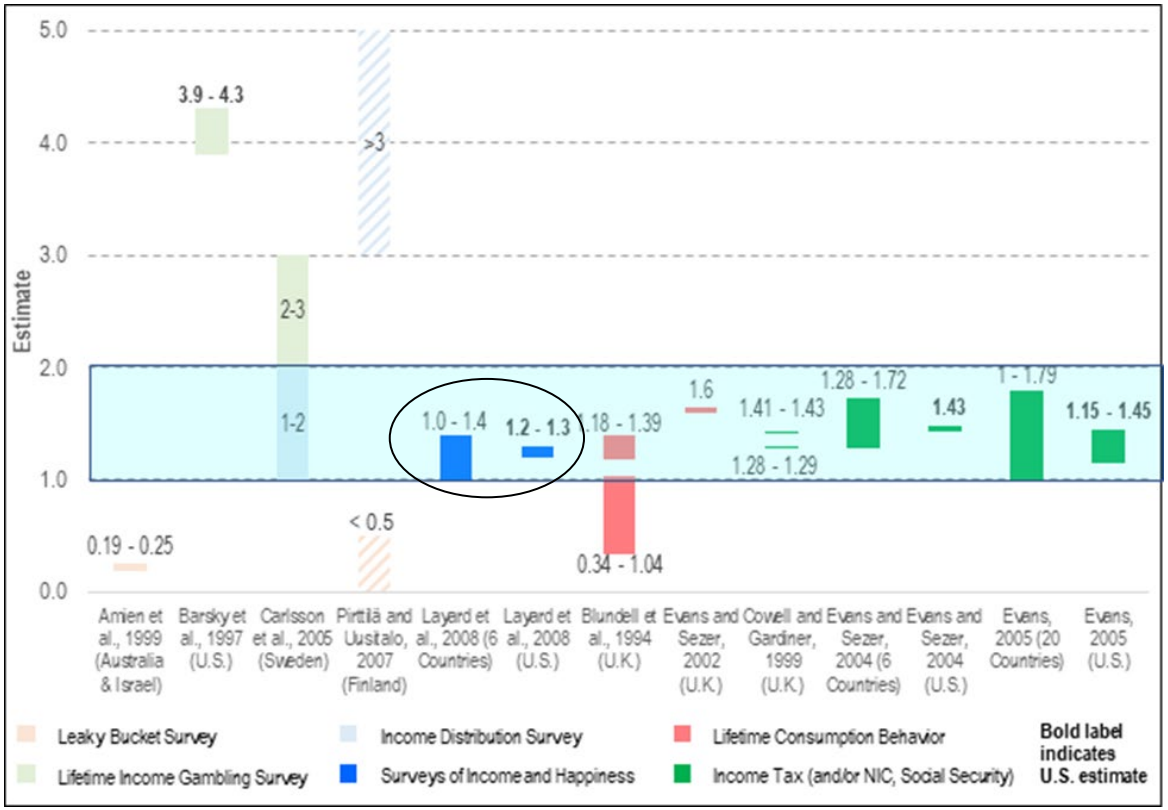
$$\frac{U_i}{U} = \left(\frac{y_i}{y}\right)^{-\varepsilon} = \left(\frac{y}{y_i}\right)^{\varepsilon}$$

ε and Utility – how useful is an additional dollar?

- Different ideas for ε
  - Aversion to inequality
  - Aversion to risk
  - Elasticity of inter-temporal substitution over time
    - How much better it is to have something today than later
  - **Elasticity of marginal utility of income**
    - How much the value of an additional dollar changes with wealth

- Layard et al (2008) used for this analysis:
  - Analyzed multiple national surveys of happiness (meta-analysis)
  - Isolated ε as direct change in "usefulness" of a dollar.
  - Simple, and data driven.

ε Values – similar across definitions/methods



- Also – results very similar to ε measured in other ways (direct CV surveys, tax data)
  - Most values between 1-2, regardless of method/definition for ε

What does utility look like in Energy Equity?

- "What do you do with your on-bill savings?"
  - Uses that have value, improve the quality of life
- Difficult-to-measure non-energy impacts (NEIs)
  - Reduced debt payments
  - Better diet
  - Prescription medicine compliance
  - Reduced stress, time saved, wellness
- Clearest when attached to actual dollars
  - Harder to argue that "improved health" differs in utility
- But Atkinson's ε could theoretically apply to all changes
  - "Inequality aversion" and "utility" can address non-monetary benefits

Key questions facing California Energy Commission

- How effective is my equity-enhancing investment?
- How does it compare to other investments or scenarios?
- How can I communicate priorities and benefits of equity to regulators, communities, public officials?

$$\frac{U_i'}{U'} = \left(\frac{y_i}{\bar{y}}\right)^{-\varepsilon} = \left(\frac{\bar{y}}{y_i}\right)^{\varepsilon}$$

California Energy Commission Equity Weighting Tool

- Uses ε to identify marginal utility with respect to income
  - 1.26 - value from Layard et al. 2008
- Applies only to on-bill savings
  - Does not weight health benefits from air quality, etc.
- Spreadsheet model:
  - Takes household/project savings as input
  - Identifies median household income for area specified
    - Relative to state median
    - Census tract, zip code, or municipality
  - Identifies and adjusts for (if not specified):
    - Percent of households likely to be separately metered
  - Calculates weight using
    - **(1/[Median Household Income of Geographic Area of Interest/Low-Income Threshold of 80% of California's Median Income])^1.26**

Comparative Results: CEC Equity Weighting Tool

General Project Characteristics	
Geographic Boundary Of On-Bill Savings	Zip Code
Census Tract	Not Selected
Zip Code	[redacted]
City	Not Selected
County	Not Selected
Median Household Income Of Selected Area	$ 35,985
Percentage of Median Household Income Relative To The State Median ($71,805)	50%

Results	
Total On-Bill Savings	$ 1,500,000
Total On-Bill Savings Directly Accruing to Families In Single-Family and Sub-Metered Multi-Family Housing	$ 1,500,000
Total On-Bill Savings Directly Accruing to Families In Single-Family and Sub-Metered Multi-Family Housing Distribution Weighted for Equity	$ 3,582,089

General Project Characteristics	
Geographic Boundary Of On-Bill Savings	Zip Code
Census Tract	Not Selected
Zip Code	90210
City	Not Selected
County	Not Selected
Median Household Income Of Selected Area	$ 173,882
Percentage of Median Household Income Relative To The State Median ($71,805)	242%

Results	
Total On-Bill Savings	$ 1,500,000
Total On-Bill Savings Directly Accruing to Families In Single-Family and Sub-Metered Multi-Family Housing	$ 1,500,000
Total On-Bill Savings Directly Accruing to Families In Single-Family and Sub-Metered Multi-Family Housing Distribution Weighted for Equity	$ 492,182

- $1.5 million in on-bill savings in both scenarios BUT
  - Utility-weighted difference of 7x between zip code with 50% MI and … 90210

Communicating California Results

- Investment dollars and on-bill savings are not changed by equity-weighting
  - Total on-bill savings are the same in both examples above, $1.5 million
- Equity weighting looks at the usefulness of those dollars
  - On-bill savings in Beverly Hills likely to be banked
  - Savings in areas with lower median income likely to change/improve household stability
- Equity weights aren't additive to other metrics
  - Could be if used as a proxy for multiple NEIs

Next Steps – "Watch this Space"

- Discussion on how to measure equity is evolving rapidly
  - Justice40, various state efforts
- Using equity weighting *to adjust benefits* is a topic of discussion in various fields
  - Kaldor-Hicks criterion is inadequate for climate change, equity
  - Cost-effectiveness is complex in underserved areas
- Re-examination of methods/data for benefit-cost estimates is ongoing, critical for NEIs
  - Data/assumptions can overlook/mis-value impacts and benefits (e.g., under-reported health impacts for key populations)

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