

# Robust Bounds for Welfare Analysis

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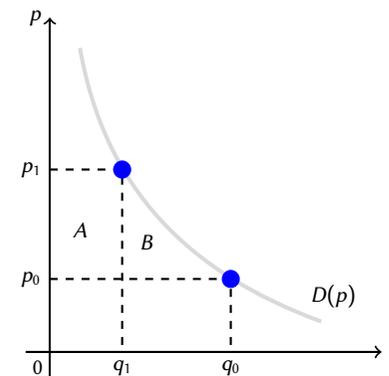
## Motivation

- ▶ Many papers in economics have the following structure:
    1. A policy (e.g., tax/subsidy) was implemented.
    2. Using prices and quantities before and after, estimate demand.
    3. Impute the change in welfare + compare to costs/revenues.
  - ▶ Measuring welfare requires taking a stance on what the demand curve looks like at unobserved points.
    - Functional forms (e.g., CES or linear demand) are often assumed for convenience.
    - Conservative bounds in lieu of functional form assumptions are often extreme.
- ↪ Is there a more principled way to engage with assumptions & evaluate welfare?

## This paper.

- ▶ Instead of interpolating to get a welfare estimate, we establish **welfare bounds**.
  - These bounds are **robust**: they give the *best-case* and *worst-case* welfare estimates that are consistent with a set of pre-specified economic assumptions.
  - These bounds are also **simple**: we can compute them in closed form.
- ▶ Our bounds are (often) meaningful both in informing the policy question and in distinguishing between assumptions.
  - They connect empirical measurements (e.g., LATE) and theoretical primitives (e.g., log-concavity).
- ▶ Our bounds shed light on welfare implications of commonly used demand curves.
  - **Example**: CES interpolation yields the *smallest welfare estimate among all possible interpolations*, assuming that the demand curve satisfies Marshall's second law.

## Model



- ▶ We consider the canonical problem of finding the change in consumer surplus when price increases from  $p_0$  to  $p_1$ .

- ▶ **Main challenge**:  $D(p)$  isn't observed.

- ▶ With  $D(p)$ , change in CS is equal to

$$\underbrace{\text{area A}}_{=(p_1 - p_0)q_1} + \text{area B} = \int_{p_0}^{p_1} D(p) dp.$$

- ▶ Without  $D(p)$ , we want to *bound* area B under different assumptions.

## Applications

- ▶ We derive bounds on the change in consumer surplus which can be applied to many settings:
  - #1. **Energy subsidies**. We apply our results to Hahn and Metcalfe (AER, 2021), who employ a large field experiment to evaluate the welfare impact of energy subsidies under the California Alternative Rates for Energy (CARE) program.
  - #2. **Trade tariffs**. We apply our results to Amiti, Redding, and Weinstein (JEP, 2019), who examine the deadweight loss due to trade tariffs imposed by the US between 2018 and 2019.
  - #3. **Old-age pensions**. To illustrate how our framework connects with the literature on the marginal value of public funds (MVPF), we apply our results to Giesecke and Jäger's (JPubE, 2021) analysis of old-age pensions in the UK.
  - #4. **Income taxation**. We apply our results to Feldstein's (ReStat, 1995) analysis of the excess burden of income taxation.