Lecture # 14 – Behavioral Economics/Distributional Effects of Environmental Policies

I. Policy Implications of Behavioral Economics for Energy Efficiency

- Consider two dimensions of policy interventions (Carlsson *et al*. *REEP* 2021)
    - Reason for intervention: Why?
        - Conventional economic problems (e.g., market failures)
        - Behavioral economic problems
    - Type of intervention: How?
        - Conventional economic tools (e.g., emission fees)
        - Behavioral economic tools (e.g., nudges)
- More generally, understanding what failures need to be addressed (e.g. market failures, behavioral failures) is important to target policies correctly
    - Behavioral failures
        - Give people freedom to make choices, but frame choices in ways to lead to good decisions
            - For example, make energy efficiency a default option
            - Aim to improve an individual's welfare by better framing choices
        - Types of nudges
            - Pure nudges: makes it easier to "do the right thing"
                - Designed to counteract inattention or poor self-control
                - Examples
                    - Putting healthy foods at top of menu
                    - Automatically enrolling in a retirement plan
            - Unlike pure nudges, a <u>pure green nudge</u> pushes people towards behavior that is socially desirable but may not be in their best interest
                - E.g. default option is a green tariff on electricity bill
                - Four types of pure green nudges
                    - Defaults: change the default option: e.g. make green energy the default
                    - Provision and simplification of information
                        - Ignoring information is not necessarily irrational, as collecting information takes time and effort.
                        - Therefore, simplifying presentation of information can help.
                        - Consumer product labels are an example

        - Changes to the physical environment
            - Kallbekken and Saelen (2011): providing smaller plates at a buffet reduced food waste by about 20%
        - Reminders
    - Moral nudges: reward people for doing the right thing through psychological utility
        - Self-focused if primarily benefits the induvial, rather than addressing an externality
        - Social proof is an example:
            - "9 out of 10 people in the city pay taxes on time"
        - Moral green nudges promote green behavior. Examples include:
            - Interpersonal motivations and social comparisons
                - E.g., comparing electricity consumption to neighbors
                - Key question: are there long-term effects, or does the effect wear off?
            - Moral suasion
                - E.g. need to avoid strain on system during peak use days
            - Goal setting and commitment
    - **Question:** Who decides what is a "good" choice?
- Potential uses of nudges with conventional policy tools
    - Pigouvian tax
        - Addresses environmental externalities from energy usage
        - Note how nudges can improve outcomes when individuals have heterogeneous preferences
            - E.g. if gasoline taxes don't perfectly target the externality, nudges to reduce traffic in urban areas target places where marginal damages are highest
        - Moral nudges may change norms, making people feel better about being taxed for pollution (e.g. improved experienced utility)
        - Taxes require payments, so likely to have larger distributional effects than nudges
        - Nudges complement taxes in the case of internalities. For instance, if consumers underestimate the future energy costs of a new refrigerator
            - Nudging those with incorrect perceptions avoids needing a higher tax that would punish those with correct perceptions.

- What conventional policy tools can be used to address energy efficiency?
  - Pigouvian tax
    - Addresses environmental externalities from energy usage
  - Subsidies are an alternative
    - Bu must consider costs of raising funds
    - Other limitations
      - By lowering costs, may have rebound effect
      - Benefits may go to higher income households
      - Treat all consumers equally. Taxes make heavy users pay more
      - Doesn't price utilization
  - Command and control: Energy efficiency standards
    - Imposes the "correct" choice on a consumer
    - May be inappropriate for some in the case of heterogeneous preferences
      - Are energy efficiency subsidies and standards a second best approach to correcting investment inefficiencies?
      - Heterogeneity in the internality across users weakens the case for subsidies
        - Thus, *who* is induced to change their behavior matters
      - Should standards apply uniformly
        - Are minimum efficiency standards for air conditioners beneficial to people in colder parts of the US?
      - Most likely to improve welfare if target the largest investment inefficiencies
        - Thus, providing information to heavy energy users (e.g. via smart meters) is more effective
  - Providing information
    - Product labeling is an example
  - Financing programs
    - Some communities fund energy efficient investments and let consumers pay it back through utility bills (e.g. from resulting savings)

II. Empirical Evidence on Energy Efficiency

- Empirical evidence on policy effectiveness
    - The article on electricity billing shows how the salience of prices matter.
        - Most people pay electricity bills monthly. They are unlikely to know how much a kWh of electricity costs or how much they used.
        - As a result, consumers are not very responsive to changes in electricity prices.
            - If this is the case, using emission fees to reduce pollution will have a small impact.
        - The article reports on households in South Africa using pre-paid meters for electricity.
            - Consumers must load credit on to the meter to use electricity, making the connection between their consumption and the cost of electricity clearer
            - Households using these meters reduced electricity use by 14% after adopting the meter.
    - The article on cookstoves in Kenya is an example of an experiment designed to determine the barriers to adopting cleaner stoves.
        - The authors consider two possibilities
            - Lack of credit
            - Inattention
        - They randomly give people one of two treatments:
            - Access to credit: pay for the stove in 3 monthly installments
            - Information: told how much money buyers could save with the stove and asked them how they would like to spend the potential savings
        - Results:
            - Offering credit raises the willingness to pay for a stove from $12 to $27
                - In these communities, credit is typically available for only a month
            - Providing information did not help
        - Policy implications
            - If credit constraints matter, raising prices through a carbon tax won't get people to buy more efficient appliances

- Information strategies
  - Social Norms
    - Allcott (*J Public Econ.* 2011) looks at a random experiment run by OPWOER
      - OPOWER is a private company that mails Home Energy Reports to households compare the household's energy usage to similar neighbors
      - The report also provides advice on how to reduce energy consumption, based on usage patterns
      - Worked with 12 utilities in six states
      - Results
        - On average, energy usage falls by about 2%
        - Highest users reduce consumption by 6.3%
        - Effect is equivalent to raising electricity prices by 11-20%
  - Gillingham *et al.* (2021) use an unexpected change in fuel economy labels to see how much buyers value fuel efficiency
    - In 2012, an EPA audit revealed that Hyundai and Kia overstated fuel economy on 13 models in the 2011-13 model years
      - The manufacturers corrected the labeling
      - Buyers who bought these cars prior to re-labeling were compensated
      - Buyers after the re-labeling received no compensation, but were given correct information
    - Comparing the change in the price of the affected vehicles to other vehicles around the same time illustrates how much users value fuel efficiency
      - Expected changes in fuel costs over the life of the vehicle requires assumptions on:
        - expected gas prices
        - driving behavior
        - the consumer's discount rate
      - Observed price changes also depend on supply elasticities
        - Willingness to pay is the gap in price between the two demand curves in the figures on the next page
        - Need to compare at the final equilibrium quantity
        - When supply is not perfectly inelastic, falling demand moves us along the supply curve, so the gap in WTP is different than the change in price.

        - Results
            - Consumers undervalue fuel efficiency. The price of the re-labeled vehicles falls, but by less than $1 per dollar increase in driving costs.
            - Their preferred specification uses a 4% discount rate. 2011-12 model prices fall by $0.39. 2013 model prices fall by $0.16.
                - Note that supply is more inelastic for the older vehicles, as they have already been built
                - Even with a 12% discount rate, prices only fall by $023-$0.58
- Economic incentives
    - Many studies find that the cost per kWh saved is greater than ex ante cost estimates
        - Need to control for free riders – e.g. those that would have adopted anyway
    - Davis *et al*. (2014) study an appliance replacement program in Mexico
        - 2009-2012: Cash for Coolers program gave households subsidies to replace old refrigerators and air conditioners with newer models
            - To get AC subsidy, needed to live in a warm climate zone. Only 25% of households eligible
            - Had to turn in an AC or refrigerator that was at least 10 years old and replace it with an new model that met minimum energy efficiency standards
                - Store had to verify that the turned in appliance worked
            - Program subsidized 1.9 million purchases. 90% were refrigerators
        - Methods
            - Use household billing data for over 25 million Mexican homes
            - Can identify homes receiving subsidies
            - Use different comparison groups:
                - Equal sized random sample of non-participants
                - Matched samples to find households with similar characteristics as participants

- Results
    - Refrigerator replacement reduces electricity consumption by 8% (12.4 kHw/month)
        - About 1/4 of what was predicted *ex ante*
    - Air conditioner replacement increases electricity usage
    - Cost effectiveness
        - Cost $0.25/kWh reduced
        - $457 per ton of CO_2 reduced
- Explanations:
    - Most appliances replaced were less than 12 years old.
    - Rebound effect: More efficient air conditioners were used more frequently
        - No change in electricity consumption in winter, but increased electricity consumption in summer
    - New appliances had additional features that increase electricity consumption (e.g. ice makers)

- Nudges versus subsidies
    - Bailey *et al*. (NBER WP#31630) use a field experiment in Calgary, Alberta to compare subsidies and nudges
    - Goal: to get electric vehicle owners to charge their vehicles during off-peak hours (10 PM – 6 AM), when the impact on the grid is smallest.
    - Households randomly divided into three groups:
        - *Rewards group*: received 3.5 cents/kWh discount to charge during off-peak hours
        - *Nudge group*: received information on the social benefits of charging during off-peak, but no discount
        - *Control group*: no intervention
    - Results:
        - Households receiving the discount more likely to charge during off-peak hours
            - Share of households charging off-peak increased from 59 to 77 percent
        - No change for the nudge group or the control group.
    - Next, the authors test for habit formation: do households continue to charge off-peak when the subsidy is removed
        - One-half of the group receiving discounts had it taken away. The other half continued to receive discounts for charging off-peak.
        - Only those receiving the discount continued to charge off-peak.

III. Evidence on Environmental Justice

- Understanding how particular groups of people are affected by environmental policy is important
    - In earlier lectures we discussed the incidence of various policies (e.g. who bears the cost of taxes or benefits of subsidies)
    - Here we look at two additional outcomes:
        - Environmental justice: Are particular groups disproportionately affected by the harms of pollution?
        - Effects of environmental regulations on jobs: what happens to workers most likely to lose jobs due to increased regulation?
- What is environmental justice?
    - The US Environmental Protection Agency defined “environmental justice” as requiring that “no group of people should bear a disproportionate share of the negative environmental consequences resulting from industrial, governmental and commercial operations or policies” and calls for “fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation and enforcement of environmental laws, regulations and policies.”
- Key questions:
    - Is there disproportionate exposure to pollution?
    - What are the economic forces behind disproportionate exposure?
    - What can be done?

- Evidence
    - Work in several fields documents correlations between pollution, race, and poverty
        - Figures 1-3 in Bahzhaf *et al* provide examples
    - Spatial units chosen for analysis matter.
        - Larger units may hide correlations (the "ecological fallacy")
        - Relationships estimated at aggregate level are only equal to relationships and the micro level is there are no group-level effects correlated with pollution (e.g. pollution is randomly distributed within the larger group)
            - This assumption is unlikely to hold
        - What does this mean for the literature?
            - Baden *et al*. (2007) survey 110 environmental justice studies and did their own analysis of exposure to hazardous waste sites
                - Evidence of racial, ethnic, and income inequities becomes stronger when using smaller units of analysis.
- Which gaps matter?
    - Colmer *et al*. (*AEA* 2024) study trends in the gap between Black and White households at different income levels
        - *Pollution level gap:* difference in pollution levels for Black and White households at a given income level
        - *Pollution rank gap:* difference in a Black household's rank in the Black pollution distribution versus what that household's rank would be in the White pollution distribution
    - Over time, the gap in the level of pollution exposure fell
    - But the rank gap (e.g. the relative position) did not change
    - In related work (Colmer *et al*. *NBER WP#33050*, 2024), they calculate that differences in income explain 10% of the observed gap in pollution exposure in 2016

IV. Understanding the Causes of Environmental Justice

- The economic literature on environmental justice focuses on establishing causal relationships.
    - Why is understanding the causal mechanisms important?
        - Helps narrow down the locus of injustice
            - E.g., is it intentional discrimination by firms, the underlying income distribution, differential government enforcement?
        - Understanding the cause is necessary to design policies to address inequities
    - Potential mechanisms leading to inequitable outcomes include:
        - disproportionate siting by firms
        - "coming to the nuisance" by households
        - market-like coordination of the two above
        - discriminatory policies and/or enforcement
- Disproportionate siting: do firms site polluting activity in poor neighborhoods and/or neighborhoods with people of color?
    - Three potential reasons:
        - Taste-based discrimination (e.g. protecting whites)
        - Siting may be based on local economic conditions, which are correlated with residential demographic patterns
            - E.g., seek out areas with inexpensive land, low-wage labor, or near transportation networks
            - These may be correlated with poorer neighborhoods
        - Government agencies may make decisions that affect siting, such as permitting processes or offering incentives to locate
    - Research suggests siting does affect people of color disproportionately, but seems to arise because of local economic conditions (e.g. low cost land and labor) (Wolverton (2009)

- Coming to the nuisance
    - What if households move based on their willingness to pay (and ability to pay) for a clean environment?
    - Based on a Tiebout model of sorting (people “vote with their feet”
        - Households choose where to live based on a budget constraint, while considering the various positive features of a neighborhood.
        - Demand for nicer neighborhoods is higher, so prices are higher.
            - => Households face a tradeoff between nicer neighborhoods and other consumption
    - In this model, poorer households get outbid for nicer neighborhood, leaving to more poor households in polluted areas
        - If one particular demographic group is richer, the results will apply to demographic groups as well
        - Initial sorting may lead to additional neighborhood effects, such as more pollution moving to lower-income areas, or richer neighborhoods attracting nicer amenities and better schools
    - Empirical evidence on Tiebout hypothesis is mixed, as there are several challenges to identifying it in the data (e.g. people moving also affect the neighborhood they leave)
    - Implications for policy
        - Observed patterns may be “efficient” even if not equitable
        - Policies should focus on income, rather than environmental inequities per se.
        - if people prefer neighborhoods with those similar to themselves (homophily), imposes a “tax” on Black households who want a cleaner environment, but can only find it in white communities
        - Cleaning up local pollution may increase housing demand, leading to higher housing prices and gentrification
            - Since poor are mostly renters, it is the landlords who benefit

- Coasean bargaining: market-like coordination of firm and individual preferences
    - Considers both the preferences of firms regarding locations and of households regarding pollution
    - Under the Coase Theorem, the distribution of payments depends on initial allocation of property. Bargaining power matters
        - Firms have incentives to locate where the willingness to accept compensation for pollution will be lowest
    - In this case, firms may locate in lower income areas because WTA is lowest. Coase says this is efficient. But recall that efficiency doesn't mean it is desirable.
        - **Key point**: The efficient outcome of this bargaining game may result in environmental injustice.
    - A key question here is whether structural factors affect the bargaining outcome for different groups.
        - Timmins and Vissing (2022) test this in the setting of leases signed between shale gas operators and households in Tarrant County, Texas for the rights to extract natural gas.
        - Leases include both royalty payments and protective clauses to reduce health and environmental risks from the extraction process.
        - If differences in lease terms are a result of efficient Coasian bargaining, controlling for income should explain differences in lease terms.
            - However, even after controlling for income, Vissing and Timmins find that race and English-speaking are correlated with poorer lease terms (e.g. lower royalties, fewer protective clauses)

    - If Coasean bargaining is correct, how should policy respond? How might policy deal with inequities in bargaining power?
        - As with sorting, puts the emphasis on inequality of income itself
            - Requires that communities have full information and full bargaining power
                - Consider the example of Kettleman City, California, which received compensation for a toxic waste incinerator. The community was 90% Hispanic, and 40% of residents spoke no English. But few translators were available during public meetings
                    - This is an example of how information asymmetry leads to market failure.
            - Are there reasons communities might not feel fully compensated?
                - Do not have full property rights. Firms locate where they want.
                - Property rights may be ambiguous, claiming rights may be difficult.
                - May be difficult for communities to overcome free rider problem
- Political economy and government
    - Regulators may be a source of inequitable exposure to environmental nuisances.
    - Communities with highest willingness to pay to avoid pollution may exert the most pressure on government agencies
    - The NY Times article on redlining shows how past policies can have lingering effects.
- What can be done? Potential ideas discussed in the reading include:
    - Given local communities a seat at the table
        - E.g., Flint, MI was affected by decisions made by higher levels of government
        - EPA policy calls for “meaningful involvement” of all people
    - Help communities bargain better
        - E.g., access to legal expertise
    - Focus on income inequality more broadly
        - Particularly relevant if sorting is the dominant mechanism
    - Consider how environmental policies affect income distribution
        - Unequal exposure suggests that policies that increase environmental protection are progressive
        - But the costs may be more burdensome to poorer households
            - E.g., less able to pay higher energy prices