Lecture # 14 – Distributional Effects of Environmental Policies

I. Energy Justice and the Energy Transition

- Considering how decarbonization of the energy sector might affect disadvantaged groups (lower income and BIPOC) provides an application of environmental justice, as well as a more general discussion of the distributional effects of policy.
    - Distributional effects include:
        - Who is affected by the negative effects of energy production? How might decarbonization change that?
            - Does the choice of policy instrument affect pollution outcomes?
            - Note how this directly relates to our discussion of the environmental justice literature.
        - What are the distributional effects of policies used to promote clean energy?
            - How do higher energy prices affect disadvantaged households? How would decarbonization change energy insecurity and energy poverty?
            - How does access to clean energy vary across households? How does policy address these differences?
        - How are workers affected by the energy transition?

A. Distributional impacts of energy production

- Distributional impacts of energy production
    - Three aspects matter:
        - Resource extraction
        - Transformation of raw materials to useable energy products
        - Transmission/transportation of energy
    - Localized negative externalities include health impacts, environmental impacts, public finance and employment impacts, and social impacts
        - In all aspects, disadvantaged households fare worse
            - Greater environmental impacts
            - Receive lower payments for mineral rights on private land
    - How might decarbonization change these patterns?
        - Health impacts likely to be better (e.g., reduced PM2.5)
        - Land use
            - Factors affecting locally undesirable land uses (LULUs) include income, low land costs, and ability to mobilize opposition
            - Likely to apply to siting of renewable projects as well
                - Rooftop solar occurs where homes are, but utility scale wind and solar require significant land.
                    - Key considerations include high renewable energy potential, low land cost, and low transmission costs
                        - Largely rural areas
            - Negative impacts will exist, but likely lower than fossil fuel infrastructure
                - Studies estimate commercial solar projects lower land values
                - Effect of solar and wind on agricultural land values mixed
                    - Access to transmission can increase land value (e.g. makes installing wind or solar easier)
        - New transmission lines needed to get renewable power from areas with best resources to where power needed. Who will have a say in siting of lines?
            - Lack of access to transmission slows development of renewable resources
        - Effects on local fossil fuel communities
            - Job losses in regions dependent on a single industry can have structural effects
                - Not only lose jobs, but also tax revenues

- Policy instrument choice and the distribution of pollution damages
    - Do market-based policies result in unequal exposure to pollution?
    - Note that, for climate change, greenhouse gases are a global externality. However, the co-benefits from lower fossil fuel consumption, such as reduced particulate matter, have local impacts.
    - Evidence from other cap-and-trade programs
        - Hernandez-Cortez and Meng (2020) combine an air transport model and regression analysis to compare the emissions gap in disadvantaged communities before and after the 2013 carbon market began in California.
            - Define the *environmental justice (EJ) gap* as the difference in emission levels between 25% worst ZIP codes and all others
                - EJ gap was growing prior to cap and trade – PM, NOX and SO2 all becoming more concentrated in the most disadvantaged ZIP codes
                - EJ gap shrank after cap-and-trade
            - Using a before and after comparison allows them to ask whether the policy *changed* the gap.
            - Key results:
                - The EJ gap was growing prior to cap and trade
                    - PM, NOX and SO2 all becoming more concentrated in the most disadvantaged ZIP codes
                - EJ gap shrank after cap-and-trade
                    - From 2012 to 2017, the gap fell 24% for SO2 & 30% for PM
            - Key question: would this generalize?
                - Depends on whether disadvantaged communities are downwind of polluters with high abatement costs

- Trading creates both winners and losers
    - Examples using RECLAIM addressed NO_X emissions in the Los Angeles area.
        - Fowlie et al. (2012) matched facilities that participated to similar facilities that didn't, and thus regulated by command-and-control.
            - Participating facilities reduced emissions more
            - Spatial clustering of emissions exists under both policies
                - Some communities are worse off with cap-and-trade (e.g. hot spots), but most experienced greater emission reductions than would have had under command and control
        - Grainger & Ruangmas (2018) modeled pollution dispersion under RECLAIM using data on prevailing winds
            - Wealthier households saw greater reduction in pollution exposure due to trading once accounting for wind, as did Black households
- Where offsets take place matters
    - Shapiro and Walker (2021) find no impact of offsets in CAA nonattainment counties in CA or TX.
        - But these offsets require purchases in the same area
    - California GHG cap-and-trade:
        - If offsets in other states are used by polluters, local co-benefits do not occur (Cushing et al. 2018)
- The blog on carbon pricing and environmental justice illustrates what this means for policy
    - California's Environmental Justice Advisory Committee proposed limiting carbon market flexibility. Because reducing greenhouse gas emissions also reduces local pollutants, they are concerned that trading will affect the distribution of local pollutants
    - Their proposal would require that emissions at facilities in disadvantaged communities fall at least as fast as the state average.
    - We'll discuss the tradeoffs from such a policy: limiting trades could costs of reducing emissions, but would ensure greater fairness.

B. Distributional impacts of energy policies

- Distributional impacts on household energy expenditures
    - How do households respond to higher energy prices? How are low-income households particularly impacted?
        - Decarbonization likely will increase energy prices
        - Lower-income households spend a larger share of income on electricity
        - Energy insecurity
            - How do households respond to higher energy prices?
                - DOE survey asks if households (1) reduce food and medicine to pay energy costs or (2) leave their home at an unhealthy temperature
                    - Not surprisingly, more likely for disadvantaged households
                - Low income households often live in less energy efficient housing
                    - Here, systematic issues often matter: e.g., less access to large retail stores with LED lightbulbs
                - Renters more likely to be affected due to the principal-agent problem: who pays energy bills and who benefits from improvements in energy efficiency not always the same
    - How can policy offset regressive impact of price increases?
        - If market-based policies used, revenues could be redistributed in a way to improve equity outcomes
        - Low-Income Home Energy Assistance Program (LIHEAP)
            - Provides block grants to US states to provide bill payment assistance as well as financial assistance for energy efficiency improvements.
        - US Department of Energy Weatherization Assistance Program (WAP)
            - Assistance for low-income families
            - Participation low: paperwork is a burden
        - Block pricing
            - Charge a lower rate for a base quantity of electricity and higher prices above that level

- Distributional impacts of access to clean energy technologies
    - Disadvantaged households have lower access to clean energy technologies (e.g. solar panels, batter backup, smart meters, electric vehicles)
    - What factors affect differential access to clean energy technologies?
        - Tax credits for clean energy go predominately to high-income households
        - More price sensitive
        - Rent vs. own
            - For EV's, need a place to charge
        - Intensity of use
            - Efficiency standards make new appliances more expensive. Low-income households may prefer a cheaper appliance that they use less frequently
        - Lower credit scores reduce access to financing (e.g. for rooftop solar)
    - Policy options
        - Target subsidies at low income groups
            - Enhanced Fleet Modernization Program in California provides incentives ($1,500) for low-income households to scrap old high-polluting cars
                - Get even more money ($4,500) if replace the older car with a car that gets 35 miles per gallon or greater gas mileage
                - Eligibility restricted to households in disadvantaged communities or households below 400% of federal poverty line
                    - Disadvantaged communities measured using a combination of income and exposure to pollution (p. 656)
                - Muehlegger & Rapson (*JPubEcon* 2022) study this program
                    - The subsidy does lead to lower prices
                    - But the price elasticity of demand of EV's is higher for low-income households
                    - Thus, targeted subsidies require spending more to achieve a given number of EV sales

- Mandates
    - To see how EV mandates may affect different groups, we can look at the effect of fuel efficiency standards
        - Generally considered more progressive than a gas tax
            - Affects decision to buy a new car, but doesn't affect usage
        - However, changing incentives to buy new cars also affects used car markets
            - As price of new cars increases, used car prices also increase
    - Levinson (2018): energy efficiency standards that set a minimum level of energy efficiency for appliances are more regressive than equivalent pollution taxes.
        - Efficiency standards only affect the product purchase and not the intensity of use.
        - Poorer households may prefer to purchase less-efficient appliances but use them less intensively.
        - Eliminating this substitution option imposes greater costs on the poor as a percentage of income.
- Promoting access to solar
    - Leasing from a third party
    - Property assessed clean energy programs
        - Pay through solar through assessment on property taxes
    - Community-based campaigns
        - A municipality selects a solar installer and offers group pricing

C. Environmental Regulation and Employment: The Energy Transition

- Historically, the environmental economics literature has paid less attention to effects of regulation on employment.
    - Typically assume full employment. Workers displaced in one sector will be re-employed elsewhere.
    - Despite this assumption, politicians routinely raise concerns about the employment effects of regulation
        - Even if employment recovers, there may be important distributional effects
- We can use recent experiences of coal-mining communities to see how climate policy may affect energy workers
    - Because of falling natural gas prices, coal mining jobs are already falling.
- Clean energy jobs are still a small share of US energy jobs (Raimi 2020)
    - Fossil fuels: 1.6 million
    - Energy efficiency: 2.3 million
    - Clean energy (wind, solar, nuclear): 500,000
- Raimi cites studies showing that climate policies lead to a net gain in jobs
    - Jobs lost in fossil fuels more than made up for by jobs in energy efficiency and renewable energy
    - Possible concerns
        - Are wages higher in fossil fuel jobs?
        - Union density higher in fossil fuel jobs
    - Weber's paper uses concepts from international trade literature, where employment concerns have been extensively studied, to think about how the coal mining industry could be affected by environmental policy.
        - Like international trade, environmental regulation increases overall efficiency. But demand for polluting industries falls, which may lead to adjustment costs.
            - Not every region need benefit. Polluting industries may be clustered in particular areas.
                - If so, regulation reduces local labor demand.
        - He applies these concepts to the U.S. coal industry from 2011-2016
            - Lower costs for natural gas and renewables reduced demand for coal
                - Total coal mine employment fell by 43% (43,467 jobs lost)
                - $4.4 billion of lost earnings
            - Further declines expected if more stringent climate policies passed

- Key concepts from trade literature
    1. Equity: Adjustments impose costs on people “whose skills, assets, or businesses are less valuable” due to adjustments in the economy after trade (p. 45)
        - Potential for small benefits for many, but large costs for a small group.
        - Equity problems are worse if those bearing the cost have low incomes prior to the policy change.
        - In the environmental literature, the effect on job losses gets less attention
            - Environmental justice literature focuses on effect of pollution on low income and other politically marginalized groups
            - Tax incidence literature considers how consumer prices adjust after policy
        - Weber asks whether the decline in coal mining affected counties with below-average prosperity – were these areas already economically depressed
            - Compares the average U.S. coal county in 2011 with the average noncoal county in the state or the country
            - Measures prosperity with per capita income, median household income, the poverty rate, and the unemployment rate
            - Coal mining counties were poorer even in 2011
                - 7% lower per capita income
                - 32% lower median household income
            - Gap grew: income rose 5% slower in coal-counties
                - 3% slower if consider increases in government transfers (e.g. unemployment insurance)

2. Politics: Because of concentrated losses, losers can organize against trade liberalization.
    - Trade researchers have studied how trade-related job losses affect voting
    - Weber shows similar effects for coal mining: Did exposure to coal industry declines lead to more Republican votes in the 2016 Presidential election?
        - Regress change in GOP votes from 2012-16 on a coal county indicator variable
            - State fixed effects allow for within-state comparisons
            - Even within states, coal mining counties were 3.1% more likely to vote GOP
3. Adjustment: how to jobs change after regulation
    - Some jobs will increase, while others will decrease
    - "adjustment refers to the direct and indirect movement of resources across the economy, including workers moving across industries and people moving across places and any resulting changes in prices for land or other assets" (p. 45).
    - Most research considers change in employment in industries affected by new policy.
        - Early work suggested small to no net effects (e.g. Morgenstern et al., 2002; Greenstone,2002)
    - Newer studies find effects when looking at specific sectors or workers
        - Kahn and Mansur (2013)
            - Compared employment at county level for adjoining counties with different attainment status
            - Using neighbors helps control for other factors likely to affect employment
            - NA status does lead to job losses in specific industries that are intensive in electricity, labor, and pollution
                - Examples include petroleum products, paper, primary metals, and transportation equipment
                - Effect is equivalent to job losses that would result from a 33% increase in electricity prices in attainment counties
        - Yip (2018) shows that the British Columbia's carbon tax hurt low-education workers
            - The tax increases the unemployment rates of medium- and low-educated males by 1.4 and 2.4 percentage points.

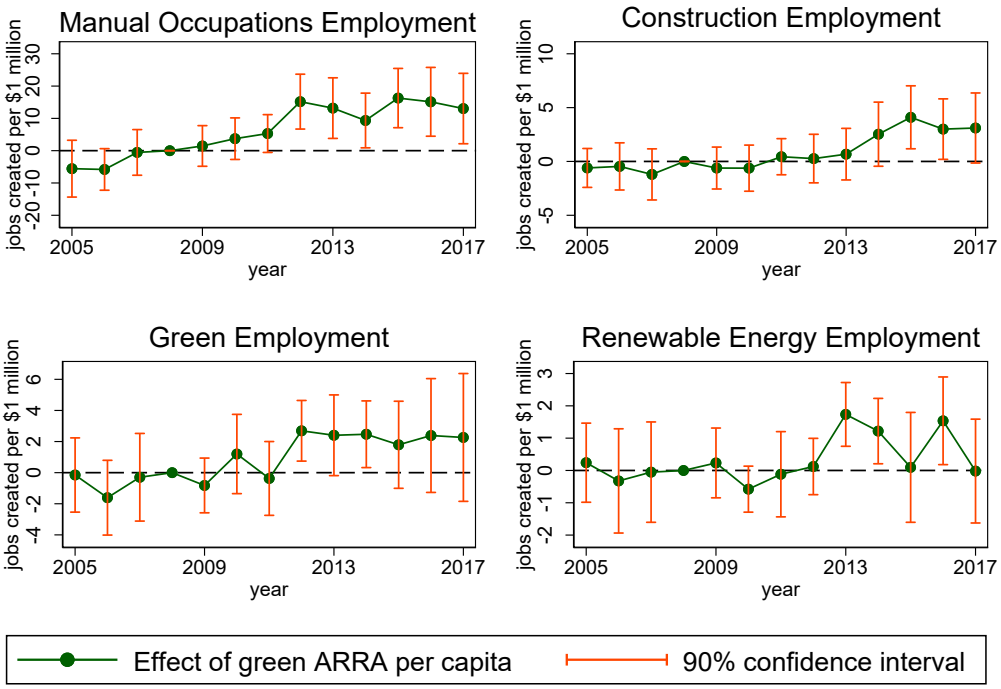
- Weber looks at adjustment using the change in coal mining employment or earnings from 2011-2016
    - Place-based adjustment: change in total employment and earnings in coal counties caused by decline in coal mining employment
        - Regress county-level change in total employment on county-level change in coal mining employment – the local employment multiplier
    - Each mining job lost reduced local employment by 0.90
        - Non-coal employment went up by 0.1 for each coal job lost
        - Earnings fell by $99,121 per job lost – suggests workers who do find new jobs get lower paying jobs

4. Efficiency trade leads to more efficient use of resources (e.g. gains from trade).
    - But if a displaced worker has difficulty finding employment in a growing sector, and thus remains unemployed, these idle resources reduce the national net benefits from trade.
    - Leads to the question if workers losing jobs due to environmental regulation regain employment quickly.
    - Walker (2013) looks at this question.
        - Also uses NA status
        - Uses plant-level data: is a plant in a NA county?
            - Analyzes effects using sectoral employment by county, sector, and year
        - Finds employment falls by 10% below 1990 levels after a change in NA status
            - This is 15% less than counterfactual trends
            - After nine years, average present discounted value of lost earnings was about 20% of pre-regulatory earnings
            - Comes to $5.4 billion in lost earnings
            - Concludes these losses are small relative to the benefits of the Clean Air Act

- Social costs of job losses (Bartik *REEP* 2015)
    - Lost earnings are not welfare losses.
    - What else matters?
        - Does a person need to relocate?
        - Are they able to relocate, or must they look for a new job in the same location?
            - Economics typically considers these choices separately.
            - If combined into a single choice, the margins of adjustment expand.
    - Could measure by asking what wage premium workers require to take a job with a higher risk of unemployment
        - That is, wages vary depending on job security
- Key takeaways
    - Relative to welfare gains from policy, the job losses have small effects on net benefits
    - But the effects on distribution of income may be larger
- Weber examines efficiency by asking if coal workers get re-employed
    - Do people get re-employed? Local efficiency-related adjustment costs are number of unemployed workers who (1) remain in the county and (2) continue to seek work
        - Use regression with change in unemployment as dependent variable
        - Divide “effect of coal mining employment on unemployment” by the “effect of coal mining employment on total employment” to get the increase in unemployment per job lost because of the decline in mining.
        - Multiply by average earnings in coal mining jobs to get local foregone earnings
    - Not all displaced workers found jobs in the same county
    - Unemployment increased by 0.32 per job lost

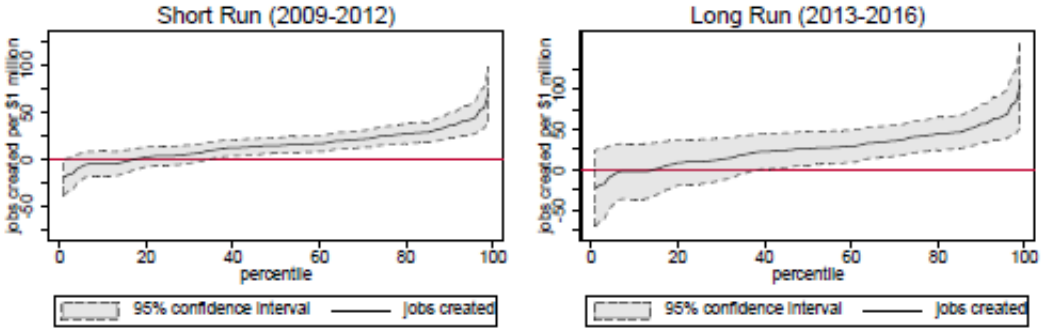
- Should environmental policy address workers who might lose their jobs in an energy transition? If so, what can be done? How might different policies focus on individual workers versus on communities?
    - Rather than summarize the excellent points made in class, which highlighted the different challenges faced when trying to help individuals versus communities, the notes below summarize some of the main points from the reading relevant for these questions.
    - In trade policy, proponents of free-trade recognize that adjustment costs matter. The US government has offered trade adjustment assistance since the 1960s
        - Training programs
        - Cash transfers to affected workers, and sometimes to communities & firms
    - Why is adjustment assistance needed? Is unemployment insurance enough?
        - Unemployment insurance pools risks, but recipients may delay finding a new job (e.g. moral hazard)
        - But designed to protect against general instability in the labor market.
            - Do not match policy-induced losses. Those bearing the costs of policy may remain worse off.
            - If a region is negatively affected by policy, doesn't help the region recover.
    - Do these work? Evidence from international trade is mixed
    - How might environmental adjustment assistance work?
        - After BP Deepwater Horizon spill, BP paid into a special fund designed to compensate people and places that suffered losses due to the spill
        - A similar scheme could be used to compensate those affected by policy
            - Example in Weber: creation of a new marine reserve prohibits fishing or oil exploration. Environmental adjustment assistance could help those losing jobs recover.
    - How (and should) coal mining communities be compensated if similar losses occurred with a national climate policy?
        - With a carbon tax, revenue could fund compensation
        - Alternatives
            - Unemployment insurance
                - But if benefits expire upon re-employment, earnings will not improve
            - Job training
                - May help recover earnings
            - Cash transfer to people harmed by policy
        - Place-based assistance
            - Current examples are small

- This leads to a question of how easy a job transition will be. My work on the effect of the 2009 stimulus shows that skills matter
    - Overall, the stimulus re-shaped the workforce. Estimates of total jobs created are imprecise (0-25 per $1 million green stimulus)
    - But there were clear gains for manual labor



NOTE: All models estimated using state fixed effects

    - Consistent with concerns over wages, wages for manual workers did not go up despite increased demand.
    - Skills matter
        - Green ARRA creates more jobs in commuting zones with more pre-existing green general skills



- Fortunately, we show that workers from fossil fuels do have skills related to green jobs