ID#②

Q1.a

(1) is a linear probability model regression

$\Rightarrow \beta_1$ = average increase in probability of subscribing to the solar microgrid for a \$1 increase in price (or whatever the price unit is)

Q1.b

Stage 1: estimate the δ's – estimate the mean utility of each choice, normalizing δ_0 (outside option) to 0.

In the simple Conditional Logit framework, this would be

$$\delta_{jtv} = \beta_{price} Price_{jtv} + \beta_{avail} Avail_{jtv} + \xi_{jtv}$$

estimated using $\hat{\delta}_{jtv} = \ln S_{jtv} - \ln S_{0tv}$ (but would be fitting s_{jtv} to S_{jtv} using δ's in mixed logit)

S_{jtv} = share of market choosing j $\quad$ S_{0tv} = share of market choosing outside option

Stage 2: Use δ's to estimate linear equation: $\delta_{jtv} = \beta_{price} \cdot Price_{jtv} + \beta_{avail} \cdot Avail_{jtv} + \xi_{jtv}$

Here, experimental price variation of the treatment helps identify β_{price} when j = solar microgrid. But other prices are still endogenous. Moreover, we may have a simultaneity issue between prices because in a small village, I imagine that other electricity vendors would react to the lower microgrid price by lowering their prices.

Q1.c

With microgrid access: $\mathbb{P}\left(i \text{ in } v,t \text{ chooses } j \,\middle|\, \vec{Price}, \vec{Avail}\right) = \dfrac{\exp\left([Price, Avail]_{jt}'\hat{\beta} + \hat{\xi}_{jtv}\right)}{1 + \sum_{k \in J} \exp\left([Price\ Avail]_{ktv}'\hat{\beta} + \xi_{ktv}\right)}$

Without microgrid access: $\mathbb{P}\left(i \text{ in } v,t \text{ chooses } j \,\middle|\, \tilde{Price}, \tilde{Avail}\right) = \dfrac{\exp\left([Price\ Avail]_{jvt}'\hat{\beta} + \xi_{jtv}\right)}{1 + \sum_{k \in J'} \exp\left([Price\ Avail]_{ktv}'\hat{\beta} + \xi_{ktv}\right)}$

ID#: 2

Question 2.a

$U = N \cdot$ (share not scrapped)

$\cancel{= N \left(\frac{P(\text{not scrap})}{P(\text{not scrap}) + P(\text{scrap})} \right) = N \frac{H(p)}{H(p) + 1 - H(p)}}$

$= N \cdot H(p)$ since p is equil. used car price ~~and used car buyers would make used care owners indifferent between fixing and selling their used car – so in e equilibrium repair~~

$= (1-U) \cdot H(p)$

$= H(p) - U \cdot H(p)$

$\Rightarrow U(1 - H(p)) = H(p)$

$\Rightarrow U = \dfrac{H(p)}{1 - H(p)}$ in equilibrium

Question 2 b

$H(p)$ = share of new vehicles not scrapped (could be sold on used market)

$p - \check{k}$ = expected profit next period if car is repaired for $\check{k}$ and sold at p
↳ expected profit conditional on not scraping

$\Rightarrow H(p)(p-\check{k})$ = expected ~~total~~ profit of a new car owner next period

Q 2.c

$H(\cdot)$, $G(\cdot)$ are CDFs

$\Rightarrow H(p)$ is monotonically increasing in p

$\Rightarrow G(\psi_n - p - H(p)(p - \check{k}))$ is monotonically increasing in ψ
monotonically decreasing in p

$\Rightarrow \dfrac{H(p)}{1-H(p)}$ is monotonically increasing in p

$\Rightarrow$ if $\psi_1, p_1, \check{k}$ are initial values and $\psi_1 \to \psi_2$ s.t. $\psi_2 > \psi_1$

then $G(\psi_2 - p_1 - H(p_1)(p_1 - \check{k})) > G(\psi_1 - p_1 - H(p_1)(p_1 - \check{k}))$

$\Rightarrow$ if $\dfrac{H(p_2)}{1-H(p_2)} = G(\psi_2 - p_2 - H(p_2)(p_2 - \check{k}))$ is the new equil.

then if $p_2 > p_1$, the RHS will $\downarrow$ from ψ_2, p_1
<u>and</u> the LHS will $\uparrow$ from p_1

if $p_2 = p_1$, LHS $\neq$ RHS
if $p_2 < p_1$, RHS $\uparrow$ from ψ_2, p_1 so LHS $\neq$ RHS
LHS $\downarrow$ from ψ_2, p_1

$\therefore$ $p_2 > p_1$ in the new equilibrium

$\Rightarrow$ standards $\uparrow$ $\Rightarrow \psi \uparrow$ $\Rightarrow$ price of used cars $\uparrow$

Q2.d

NO

(1) CA makes a lot of cars that will be used elsewhere, so the air quality improvements will not be wholly w/i CA

(2) NOx is a regional pollutant — Nevada residents suffer welfare losses from LA's NOx emissions, so CA ~~houses~~ resident are not the only affected agents from a decrease in CA emissions

(3) Copollutants: decreasing NOx will likely decrease CO2 (perhaps CH_4) which are global pollutants

~~(4) Air quality may not be~~

(4) Residential sorting: ↑ car p ⇒ ↑ housing p near work locations

this ↑ housing price may confound ↑ house price from cleaner air

(5) Used car buyers may switch to dirtier cars b/c they will stay cheaper than cleaner used cars. The used car market is also affected and implies that used car buyers/owners welfare will be affected which may not be capitalized into house values.

Q2.e

No

① As we saw above, $\uparrow \psi \Rightarrow \uparrow p$ so these policies will have an effect on the used car market too depending on repair costs
$\Rightarrow$ need information about used car market

② $\uparrow$ car prices may also $\uparrow$ general transportation costs

$\Rightarrow \uparrow$ food costs $\Rightarrow \downarrow$ welfare for low income folks disproportionately

ID#: 2

Q3.a

no time :(

Q3.b

- depends on existing distortions but would be my first guess for an efficient policy — taxing the externality directly

Optimal tax rate: ~ marginal damage of CH_4

Q3.c

Heterogenious leakage and costs

firms j have leakage θ_j $\quad (e_j = \theta_j \cdot x_j)$ $\quad \theta_j$ = # of emissions per unit x produced

1st best allocation

$$SWF = U(X) - \phi \cdot \sum_j \theta_j x_j \qquad X = \sum_j x_j, \quad \phi = \text{marg. damage of } CH_4$$

$$\max_{x_j} SWF$$

Planners tax problem for no NMS

$$SWF_1 = U\Big(\sum_j x_j(t)\Big) - \phi \sum_j \theta_j \cdot x_j(t) \qquad \text{where } x_j(t) = \arg\max \pi(x) = \cancel{p \cdot x_j - C_j(x_j) - t x_j - g_j(\theta_j x_j)}$$

$$\arg\max \pi(x) = p \cdot x_j - C_j(x_j) - t \cdot x_j$$

$\rightarrow$ no incentive to abate (tax on output)

Planners tax problem for NMS

$$SWF_2 = U\Big(\sum_j x_j(t)\Big) - \phi \sum_j \theta_j x_j(t)$$

$$x_j(t) = \arg\max \pi(x_j) = p \cdot x_j - C_j(x_j) - t(\theta_j x_j - a_j) - g_j(a_j)$$

a_j = amount CH_4 abated, $\quad g_j(\cdot)$ firms abatement cost.

Want to know $SWF_2 - SWF_1$ to see if benefit to society is worth the cost.

Q4.1

ID# ②

no time :(

Q4.2

no time ¨̂

Q4.3

no time :(

Q 4.4 pass-through

Distributional impacts of policies are important for both the researcher wanting to understand the problem, and for the policy maker wanting to be re-elected. Pass through can help distinguish who are the winners and losers of a policy by helping describe who is bearing the burden of a policy. High pass through indicates that consumers are experiencing more of the incidence of ~~a~~ the costs of a policy, and if demand is fairly inelastic, will probably be paying the cost of the policy (as apposed to taking from oligopolistic firm profits).

If low-income groups are the primary consumer of a regulated good, for example, high pass-through may indicate that low income groups are paying the largest share of the costs.

Q4.5 Market power + policy

(2)

~~Market power can~~

① If you can't regulate the emissions directly and must choose a related good to regulate, market structure may determine where in the supply chain we choose to regulate. It may be more efficient to regulate a more competitive upstream source providing inputs than to regulate a downstream monopoly, depending on relative supply and demand characteristics in each market.

② One large cost of regulation can be measurement & monitoring for compliance. It may be far less costly to monitor a consolidated market with few firms than to monitor a more dispersed downstream market with hundreds or thousands of firms.