ESM 204: Gas Tax Incidence in France

This homework asks you to examine the possible distributional effects of a (mostly real) proposal to raise the gas tax in France. The overall questions are: (1) What will be the distributional effects of the tax increase? (2) How much revenue will be generated for infrastructure repairs? (3) By how much will environmental damage be reduced and who will benefit? (4) What is the role of electric vehicle demand?

You can use the following stylized facts:

- Consumers can be separated into two income groups: "High" and "Low". The data set provides price (in $) and quantity (in gallons) estimates of demand per day for the two groups. Run regressions to estimate the demand curves for "High" and "Low" income consumers.
- Initially, there is no gas tax.
- The current gas price (without any taxes) is $5.00/gal.
- The marginal cost of producing a gallon of gasoline is linear and has price-intercept of 0. For the purposes of this exercise, you can assume that France is self-contained in supply and demand (you don't need to worry about global markets).
- Consuming each gallon of gasoline creates an environmental and health externality in France of approximately $2.00.

Your assignment is to walk through the following analyses and then draft a memo to President Macron advising him on the answers to the three questions posed at the top of this page. You can include a technical appendix with responses to these questions.

1. What is the aggregate daily demand curve for gasoline in France? What is the supply curve for gasoline? What is the "benefit" to consumers under the status quo? What is the "benefit" to producers under the status quo? What is the environmental cost under the status quo?
2. How is the current consumer benefit divided between "High" and "Low" income consumers?
3. A gas tax of $0.50/gal. is proposed. What would be the effects of this tax on:
    a. The amount of gasoline produced and sold in France.
    b. The price of gasoline.
    c. Welfare of "High" income consumers.
    d. Welfare of "Low" income consumers.
    e. Welfare of gas producers.
    f. Total environmental damage.
    g. Total revenue generated by the tax.
4. Now, assume that all revenue from a tax will be used for infrastructure repairs, and that the benefit of this is proportional to the amount you drive (i.e. to the gas you consume). Also assume that "Low" income consumers bear all environmental costs. For a range of gas taxes (ranging from $0 - $5.00/gal), calculate the effects of the tax on:
    a. Overall welfare of "High" income consumers

    b. Overall welfare of “Low” income consumers
    c. Gas producers
5. Finally, assume that electric cars will gain popularity and that in the future this will lower the demand curves of all income groups by half (vertically). Under these new demand curves, what are the effects on:
    a. Gas consumption by “High” income consumers
    b. Gas consumption by “Low” income consumers
    c. Gas price
    d. Environmental damage from gasoline
6. Using these numbers, which has a bigger impact on environmental quality, a $2.00/gal. gas tax or the invention of electric cars? Provide your evidence.