Home Assignment

UEC-51806 Advanced Microeconomics, Part 1, Fall 2023
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Due date: October 2, 2023 (Monday)

Consider a food waste abatement cost function of the form

$$C = A\frac{1}{Q^{\tau}}\left(\frac{1}{\alpha_A} - \frac{\theta\bar{\alpha}_U}{1-\bar{\alpha}_U}\right) = A\frac{\left(1-\bar{\alpha}_U-\alpha_A\right)^{\tau}}{X^{\tau}}\left(\frac{1}{\alpha_A} - \frac{\theta\bar{\alpha}_U}{1-\bar{\alpha}_U}\right),$$

where α_A and $\bar{\alpha}_U$ denote the rate of edible and inedible food waste, respectively; Q denotes food purchases, X is food consumption [$X = \left(1-\bar{\alpha}_U-\alpha_A\right)Q$], A is a calibrating constant and τ and θ denote behavioral parameters. The consumer can choose X and α_A.

a.) State the conditions for convexity of this cost function.
b.) What is the abatement cost when the rate of edible food waste
   i) is the highest it can get? [Note for math aficionados: one case is problematic. Can you identify it?]
   ii) approaches zero?
c.) What is the economic interpretation of the parameter τ?

A side note (that will not help you solve this problem at all): The English pronunciation of the Greek letter τ is [tau]. However, the contemporary descendants of Homer and Euclid would likely not understand what we talk about as the Greek pronunciation is [tʌf]. This said, it is possible (although not very likely) that Homer and Euclid would understand us, as it is known that the current Greek differs from the ancient one. In any event, my objective was not to make the home assignment 2 τ 4 u.

d.) Under what condition does the abatement cost decrease with the rate of inedible food waste?
e.) Under what condition does a decrease in the rate of inedible food waste reduce the abatement cost?
f.) Parameters τ and θ of a well-behaved food waste abatement cost function require that conditions in d.) and e.) be met simultaneously. What are the implications of this for the value of θ? What is the minimum value of τ (call it $\tau_{\min}$) for this to happen? What is the sign of $\tau_{\min}$ when $\theta < 0$?
g.) What range of values of τ is consistent with the idea of scale effects, that is, that the average abatement cost decreases with purchases/production?
h.) Set up a general consumer maximization problem (just two commodities: food and the numeraire good, i.e., everything else), incorporating the food waste abatement cost function in it. Specify the general first-order conditions. Will the ensuing demand functions for the two goods depend on the rate of edible food waste? Justify your answer.