Economics 301
Problem Set due November 3, 2023 Upload your answers to canvas

1) Last week we used an Edgeworth box to work out the effect of a (non-uniform) fossil fuel tax on aggregate fossil fuel consumption, show conditions under which levying the tax increases consumption.

a) A world aggregate fossil-fuel demand curve can be traced out by varying the fuel-quantity dimension of the Edgeworth box and plotting that against the corresponding equilibrium relative factor price of fossil fuels. How is the slope of the aggregate fossil-fuel demand curve related to Marshall's Law of derived demand?

b) Ignoring any externality for the moment, can the area under the fossil-fuel demand curve be interpreted as the value to consumers of fossil fuels?

c) Last week we also posited a fossil-fuel supply curve that increases with the relative factor price. Combining that with the demand curve yields a supply-demand diagram for the fossil-fuel market. Can that diagram represent last week's result regarding (preference) shifts in the relative demand for the local economy's output?

d) Can the supply-demand diagram for the fossil-fuel market represent the possibility that the local fossil fuel tax increases aggregate fuel consumption? Does it require a fossil-fuel demand curve that slopes up?

e) <u>True, False, or Uncertain</u>: As a practical matter, the possibility that the local tax increases global fossil fuel usage can be ignored as long as the local economy is sufficiently small relative to the rest of the world.

2) What is the incidence of a successful auto workers strike? Here we model that as a wage increase imposed on auto manufacturers for the benefit of the persons who were autoworkers at the time of the successful strike. Specifically, the economic equivalent of a tax is imposed on the use of labor by auto manufacturers with the "revenue" given lump sum to the striking members. We ignore lost output during the strike (it was sufficiently brief) and assume that the success of the strike was unanticipated (the pre-strike competition to become an auto workers was not affected by the windfall that was to come).

Workers and capital owners consume automobiles and the composite of all other goods. Those preferences are homothetic. Both sectors exhibit constant returns to scale in production, which uses capital and labor as production inputs. For the moment, the aggregate supply of capital is fixed, with the market determining how it is allocated between the two sectors.

The aggregate supply of labor is fixed. To simplify the analysis of income effects, we assume representative worker families that do not necessarily own capital but allocate their labor endowment between the two sectors.

a) Use an Edgeworth box to compare the competitive equilibrium with a successful strike to the equilibrium without one.

b) Is it possible that worker families are worse off from a successful strike? What values of the model parameters would make their benefit small or negative?

c) Is it possible that the owners of capital are better off? How do these two questions of incidence relate to the supply-demand analysis of ethanol subsidies in the Introduction of *Chicago Price Theory*?

d) The president of the auto worker union points out that labor is a small share of the costs of making an automobile. What does your answer to (b) say about the relevance of his observation for determining the worker-family benefit of a successful strike? What does Marshall's Law say about its relevance to predicting the effect on the number of workers employed in auto manufacturing?

e) Now we let the aggregate capital stock be endogenous. Following Chapter 18 of Chicago Price Theory, we replace the $dK = 0$ condition with a fixed return $dr = 0$. In this model is it possible that worker families are worse off from a successful strike?