Economics 301
Problem Set due October 27, 2023   Upload your answers to canvas

1) A local government plans to levy a tax on the use of fossil fuel by its producers. Here we want to assess the effect of the tax on worldwide greenhouse gas (GHG) emissions, which are proportional to the amount of fuel consumed worldwide.

A potentially helpful tool is the Edgeworth box, with the local economy in one corner and the rest of the world (ROW) in the other. The dimensions of the box, both quantities, are fossil fuels and a composite of all other production inputs. Each economy's production exhibits constant returns in the two inputs. Until part (h), assume that both production factors are mobile between sectors.

Consumers have homothetic preferences over the local output and the output in the rest of the world. For simplicity, we represent that as a relative demand curve for the two that depends on the relative price of each area's output.

   a) Holding constant the dimensions of the box, what is the effect of the tax on global emissions? Don't overthink this.

   b) If both economies have the same production function, how is the no-tax equilibrium represented in the box? What if their production functions are different?

   c) How is the equilibrium with local tax represented?

   d) If we were to augment the Edgeworth box with an endogenous supply of fossil fuel, and the model parameters were such that the tax reduce the ROW price of fuel relative to other production inputs, what can you say about the impact of the tax on global emissions? If more information is needed to sign the effect, explain.

   e) Absent the tax, how would a shift in relative demand for the local economy good affect global emissions? What model parameters determine the magnitude of the effect.

   f) Holding constant the relative demand curve, can you sign the effect of the local tax on global emissions? What model parameters determine its magnitude?

   g) Thus far, we have held fixed each economy's production function. If the ROW has a choice of more or less fuel-intensive production technologies, how would the local tax affect that choice?

   h) The Edgeworth Box approach rules out transport costs between the two areas. Discuss how your answer to (f) might be different with transport costs. Does it matter whether the transportation is fuel intensive?

2) Data from an oil-importing country suggest that a world oil-price shock increased its real GDP, especially because it ramped up production of new automobiles, which tend to be more fuel efficient than the old ones.

True, False, or Uncertain: Either real GDP fell (the data is wrong), or the residents of that country were better off as a result of the shock.