

Consider two small economies, Argentina and Peru, with no other trading partners. Assume each only has two industries, agriculture ( $Q_A$ ) and mining ( $Q_M$ ), and three factors of production: water (W), topsoil (T), and underground minerals (U). Water is used in both agriculture and mining, while topsoil is specific to agriculture and underground minerals are specific to mining. Assume the production functions for both industries exhibit both constant returns to scale and diminishing marginal products. Further assume that Argentina and Peru both have the same quantity of underground minerals and water, but Argentina has substantially more topsoil.

1. Draw the PPFs for both Argentina and Peru on separate diagrams, putting agriculture on the horizontal axis. Using indifference curves, show how identical preferences would lead to different relative prices ( $P_A/P_M$ ) at autarky.
2. On each graph, explain how free trade would affect the relative prices in each country, and show on your diagram how this would affect the production and consumption combinations in each country.
3. In each country, how would free trade affect the real income of topsoil owners, the real income of the owners of underground mineral rights, the real price of water, and overall social utility?
4. Now suppose Argentina and Peru already have free trade, when Peru suddenly discovers new deposits of underground minerals. Show how will this will affect Peru's PPF. Assuming Peru is not a small producer of mining, how will this affect Peru's terms of trade? How will this affect the terms of trade for Argentina?
5. Will Peru be better off after the new discovery? Will Argentina be better off? How will the new discovery in Peru affect the income of Argentina's owners of topsoil and underground mineral rights?