

1. (15%) Consider the incentives to save and invest in two countries, Japan and the United States. Both are similar economies with similar returns on investment, but Japanese consumers have stronger preferences for the future while U.S. consumers strongly prefer current consumption.

- a) Using a two-period model of intertemporal trade (i.e., with PPFs and indifference curves), with current consumption on the horizontal axis, show the autarky amount of savings and investment for both countries. Which country would have the higher savings rate in autarky? Which country would have the higher growth rate?
- b) If savings were allowed to flow internationally, which direction would it flow, and what would happen to domestic investment, future output, and overall welfare in each country? Show this on your graphs.
- c) Which country would have a trade surplus in the present, and which would have a deficit? What about in the future?

2. (20%) Consider a large economy that produces two goods, an exportable good  $X$  and an importable good  $Y$ . Assume of course that this country has a comparative advantage in  $X$  and there is free trade.

- a) Using PPFs and indifference curves with  $X$  on the horizontal axis, show the economy's free trade equilibrium.
- b) Suppose that this economy now receives a large transfer of foreign savings from a major trading partner. Assuming there is no effect on the terms of trade, show and explain how this transfer affects current consumption of both goods, assuming both are normal.
- c) How would this transfer affect this economy's trade balance (i.e., the current account)?
- d) Using a graph for the foreign exchange market, show how this transfer would affect the direct foreign exchange rate  $E$ . How would this change in  $E$  affect exports?
- e) Suppose that the demand for  $X$  goods is relatively inelastic with regard to both price and income. How would the transfer affect this economy's terms of trade?
- f) How would repayment of this foreign savings transfer (with interest) affect this country's consumption and the trade balance in the future?
- g) Suppose that this economy uses most of the current foreign savings transfer for investment in the  $X$  industry, instead of for consumption. Show how this would affect the economy's future PPF for these two goods, and by graphing the future free trade equilibrium show how this could lead to greater consumption in the future even though this economy has to make the repayment.

3. (10%) The United States imports steel from the rest of the world at a free-trade price of roughly \$200 per metric ton. U.S. production is approximately 135 million metric tons (MMT) per year, and consumption is 180 MMT. Suppose that the steel industry requests an \$80 tariff to provide protection from foreign imports. You look up price elasticity estimates and quickly estimate that an \$80 tariff would increase domestic steel prices by \$50, increase domestic production to 140 MMT, and decrease domestic consumption to 170 MMT. You also figure that this tariff would decrease the world price of steel by \$30.

- a) Show a graph for the steel industry, and diagram how this tariff affects the domestic market. Calculate the effect of the tariff on consumer surplus, producer surplus, and government revenue. What is the net effect on national welfare?
- b) Calculate the effect of the U.S. tariff on foreign welfare and net world welfare.
- c) What are the other possible consequences of the tariff?

4. (10%) Suppose that two similarly-sized countries are engaged in free trade, where the home country exports planes to the foreign country, and imports steel from them. Their governments are each independently considering whether or not to impose tariffs on their imports. If neither imposes a tariff, each receives \$100 billion in gains from trade. If one country imposes a tariff but the other country does not, the tariff-imposing country will receive \$140 billion in total gains, while the gains to the other country will fall to \$10 billion. If both countries impose tariffs, then each country will only receive \$50 billion in gains. Show how this problem leads to a Prisoner's Dilemma if both countries try to maximize their own welfare, taking the actions of the other country as independent or given. What is each country's dominant strategy? What is the Nash equilibrium? What is the social optimum, and what strategies could help countries reach it?

5. (20%) The U.S. both produces and imports petroleum. Consumption of petroleum and its byproducts has a significant external (spillover) cost, including air pollution, urban sprawl, congestion, noise, fatalities, and global warming. Suppose that the government begins to take this external cost seriously, and is considering alternative policies. The current world price of petroleum is (roughly) \$60 per barrel, and at that price the U.S. produces 160 million barrels per month (Texas produces the most of any state) and imports 430 million barrels per month (Canada is our largest supplier, believe it or not, followed by Mexico, Saudi Arabia, and Venezuela). The U.S. is (really!) considered to be a price-taker in the world market, meaning our effect on world oil prices is small.

- a) Suppose that the U.S. government adds a \$10 tariff to each barrel of imported oil, and this raises the domestic price to \$70, increases domestic production to 190 million barrels per month, and decreases consumption to 550 million barrels. Show, calculate and explain the effects of this tariff on domestic producer surplus, domestic consumer surplus, and the government budget. In the absence of an externality, would this tariff improve or worsen efficiency? By how much?
- b) Suppose economists estimate that the marginal external cost from oil consumption is roughly \$20 per barrel. Considering the effects of reduced consumption on this consumption externality, would this tariff improve or worsen our net national welfare? By how much?
- c) Suppose that the U.S. government instead puts a \$10 consumption tax on the consumption of each barrel of oil, regardless of whether the oil is imported or domestically-produced. Because we are a price-taker, this would not affect the before-tax price of oil, but by making the effective after-tax price equal to \$70, it would reduce consumption exactly as the tariff does. Show, calculate and explain the effects of this consumption tax on domestic producer surplus, domestic consumer surplus, the government budget, and the consumption externality. Would this tax improve or worsen our net national welfare, relative to the \$10 tariff? By how much?
- d) For a consumption externality, which is the better policy, an import tariff, a production subsidy, a consumption tax, or no intervention? What is the optimal amount of the tariff, subsidy, or tax? Explain.

6. (15%) Explain the relative merits/demerits of tariffs, subsidies, quotas, and voluntary export restraints as a means of saving jobs from import competition. Graphs may be appropriate.

7. (10%) Using a standard labor allocation graph for exportables ( $X$ ) on the left and importables ( $Y$ ) on the right, show how an increase in  $P_x$  and a fall in  $P_y$  due to freer international trade would affect labor demand, wages, and labor allocation. Show how these effects may differ if (a) labor is immobile between sectors, or (b) wages are downwardly rigid. Explain why *both* of these assumptions are necessary to predict that trade causes short-run unemployment.

**Bonus. (10%)** Consider a labor-abundant, less-developed country which produces two goods, manufacturing and agriculture. Manufacturing is urban and capital-intensive, and agriculture is rural and labor-intensive.

- a) Under free trade, what would be the expected patterns of trade? Using the labor allocation graph to explain how a policy of import substitution would affect labor allocation and wages in the two sectors in the standard model. Why would import substitution lead to falling wages?
- b) Assume instead that the marginal product of labor in agriculture is zero, so there is surplus labor. Graph the Lewis model of labor allocation. Why does this model suggest that import substitution might be the best trade policy for economic development?
- c) Assume that there is no surplus labor, but workers in urban areas have significantly more political power. Graph the Harris-Todaro model of labor allocation. Why might import substitution in this case be a bad economic policy?

**Supplemental Question for Graduate Students only: Due Friday Afternoon**

Short essays: 10 points each.

8. In problem #5, there was a negative externality resulting from consumption of petroleum. Suppose that instead that the externality associated with the petroleum market was (a) a negative domestic production externality (e.g., from oil spills and environmental damage at drilling sites), or (b) a negative foreign production externality (e.g., from countries like Saudi Arabia funding terrorists). What would be the optimal U.S. policy in each of those cases?
9. What was GATT, what were its main rules, principles, and exceptions, and why did it evolve into the WTO? How successful has GATT been?
10. Explain the infant industry argument for protectionism, and how a learning curve or external economies might justify temporary protection. What conditions are required for government intervention to be necessary? What is the evidence regarding the effectiveness of this justification for protectionism?
11. Under what conditions would the imperfect competition argument be a valid justification for protectionism? In which cases is it invalid?
12. Why is there so much opposition to free trade?