

## Exam 3

Answer Any **Two Questions**. Answer all parts to each question.

1. **Answer all parts to this question.**

- (a) Discuss the concepts of trade creation and trade diversion and their relevance for determining whether a Free Trade Area is beneficial. **(7 points)**
- (b) To illustrate the effects of a free trade area, consider its impact in a single market. Let the supply and demand for computers in Mexico be given by:

$$D = 6,000 - P^d ; S = 2P^d \quad \text{where } P^d \text{ is the price of computers in Mexico.}$$

Assume Mexico is a small country and can buy computers (at given prices) from either Japan or the US. The prices charged by firms in each country are:  $P^j = 800$ ;  $P^{us} = 1,000$ .

- i. Assume that initially Mexico had an import tariff of 100% on imported computers, no matter where they were produced. Calculate the Mexican price and the amount of computers Mexico imports from each country. **(5 points)**
- ii. Assume Mexico forms a free trade area (FTA) with the U.S., eliminating tariffs on US products but maintaining tariffs at their original level (of 100%) on Japanese goods. *How does the removal of tariffs on US computers affect the volume of Mexican imports and from whom Mexico imports? Calculate the welfare consequences for Mexico from this policy change* (i.e., calculate the changes in consumer surplus, producer surplus and government tariff revenue and the overall effect). **(12 points)**
- iii. Redo part (ii) assuming Mexico's import tariff on computer imports, either from the U.S. or Japan, was initially **50%**. For this case, *how does Mexico's removal of tariffs on US computers, while maintaining 50% tariffs on computers from Japan, affect Mexican welfare? Calculate the welfare consequences for Mexico from this policy change.* **(12 points)**
- iv. Suppose Mexico, before forming the free trade area, converted its tariffs on imports from Japan into quotas. After the FTA with the US is formed, Mexican importers will be permitted to import as many computers (but no more) – tariff free - from Japan as they imported before the FTA was formed. Use your answers to part (biii) to show how the removal of tariffs on US products affects: (1)total Mexican imports and (2)from where the imports come. In this case can the formation of the FTA hurt Mexico? Explain (you do not need to give a numerical answer but you should use your answer from part (iii) in helping to explain your reasoning). **(8 points)**
- v. Assume several countries in Africa, which are located near each other, are considering forming a FTA among themselves. Use your answers to the above parts to formulate criteria you would use to judge whether the FTA is likely to be mutually beneficial. Discuss other factors that also might affect the benefits from a FTA. **(6 points)**

**2. Answer all parts to this question.**

- (a) Consider the case of a small country, Canada, in which domestic steel production creates domestic pollution, which harms other Canadian producers and consumers (e.g., by polluting the water). Assume that economic estimates indicate that the pollution damages are **\$80/ton** of steel produced in Canada. {Assume for this part that there are no global effects of pollution, so Canada is not harmed by foreign steel production and Canadian production does not harm other countries}.

The Canadian domestic demand and supply curves for steel are given by:

$$D = 1600 - P^c; \quad S = 3P^f$$

where  $P^c$  is the price Canadian consumers pay and  $P^f$  is the price Canadian firms receive (in \$/ton). If there are no domestic taxes or subsidies on steel, the consumer and producer prices are the same ( $P^c = P^f$ ). Finally, assume that Canada can buy or sell steel on world markets at the (given) price of **\$500/ton**.

- i. Find the autarky (no trade) equilibrium in Canada, assuming no domestic taxes or subsidies. Is this equilibrium efficient? Explain briefly. **(8 points)**
  - ii. Suppose Canada opens itself to world markets and allows free trade in steel. *In general*, will Canada necessarily benefit from eliminating trade restrictions if pollution is present? For this specific case, **calculate the changes in welfare in Canada due to the move to free trade in steel (numerical answers are required)**. **(10 points)**
  - iii. Suppose the world price of steel were **\$350/ton**, instead of **\$500/ton**. Would the move from autarky to free trade lower Canadian welfare? (you do not need a numerical answer, but you need to explain your answer). **(6 points)**
  - iv. What is the optimal government policy (if any) to deal with the pollution created by steel production? Are trade restrictions part of this optimal policy? Be specific. **(8 points)**
  - v. Assume Canada cannot implement the optimal policy of part (iv), and its only feasible policy is a trade policy (an export tariff/subsidy, or an import tariff/subsidy). If the world price is **\$350/ton**, what trade policy should Canada implement (a numerical answer is not needed). **(6 points)**
- (b) Continue to consider the case where production of steel creates pollution, but now assume that all steel producers create pollution, and that pollution, no matter where it occurs, harms people in all countries (e.g., greenhouse gases and global climate change). To make matters simple, assume there are two major polluters, the U.S. and China, that pollution is caused by steel production and that world trade in steel occurs.
- i. Assuming a global agreement could be reached to limit pollution, explain what economic criteria should be used - if the goal were **economic efficiency** - in (1)deciding how much total pollution to allow and (2)how much pollution to allow in each country. **(7 points)**
  - ii. Suppose a global agreement is not reached, so that countries regulate pollution according to their self-interest (remember each country is damaged by pollution, and policy-makers know this). Would this non-cooperative regulation lead to lower or higher levels of pollution than the efficient global agreement described in part (i) above? Carefully justify your answer. Explain what factors a country's leaders would consider when deciding whether to tighten pollution regulation (via taxes or quantitative limits) in the country. **(7 points)**

3. **Answer all parts to this question.**

Assume the European Union (EU) and Russia (RU) are the only “countries” (or economic blocs) which trade in natural gas. Each country is large (in an economic sense) and realizes its imports or exports affect world price (measured in \$ per million BTU). Supply and demand curves in each country are:

$$EU : S^{us} = 400P_{ng}^{eu}; D^{us} = 6000 - 200P_{ng}^{eu};$$

$$Russia : S^{RU} = 500P_{ng}^{RU}; D^j = 2400 - 100P_{ng}^{RU};$$

- a) Show graphically how the free trade equilibrium price is determined and calculate this free trade price. Also, briefly explain why each country can gain by some trade restriction. **(5 points)**
- b) Assume Russia imposes an export tariff of  $t$  on natural gas exports. **Show graphically and calculate** how this export tariff affects: (i)the price of natural gas in the EU and in Russia; (ii)the amount of natural gas traded; (iii)Russian welfare; (iv)EU welfare; and (v)World welfare. Can this tariff raise Russian welfare? Can it increase world welfare (which is the sum of producer surplus, consumer surplus and tariff revenue for each country)? Explain. **(12 points)**
- c) Find the export tariff that maximizes Russian welfare. **(8 points)**
- d) Given the Russian export tariff, does the EU have any incentive to tax or subsidize natural gas imports? If so, which should it do and why? **(5 points)**
- e) Suppose Russia has an export tariff of  $(3/2)$ , and the EU has an import tariff of  $(3/2)$ . Show that the EU has no incentive to lower its tariff (by symmetry, neither does Russia). Show both countries are worse off with these tariffs than they would be with free trade. **(9 points)**
- i. Explain why an international agreement is needed to reach free trade and why free trade leads to larger world welfare (economic efficiency) than does restricted trade. **(4 points)**
- f) Suppose a free trade agreement is reached – this agreement bans any export or import restrictions. Given this agreement, does the EU have any incentive to tax or subsidize domestic natural gas production? If so, which should it do (tax or subsidize) and why? Show graphically how this policy affects world price, and EU and Russian welfare (no calculations are needed). **(7 points)**

4. **Answer all parts to this question.**

- (a) Consider a Ricardian model with three goods ( $F$ , food,  $C$ , clothing and  $E$ , electronics) and two countries (US, China). The labor productivity in each country is given by:

Output per day			
	F	C	E
US	20	8	4
China	2	8	2

- i. Assuming no trade, state the autarky relative price of clothing and electronics (in terms of food) in each country. Where is the real wage higher? Be as specific as possible. **(6 points)**
  - ii. Suppose the US and China sign a limited free trade agreement (FTA) that allows trade in clothing and electronics, but does not allow trade in food. What will the pattern of trade between the US and China be and what happens to the relative price of clothing and electronics (in terms of food) in each country? How does this FTA affect the real wage in the US and China and what can you conclude about the possible values of the post-trade ratio of the US wage divided by the Chinese wage ( $W^{us}/W^c$ )? Be specific. **(7 points)**
  - iii. Suppose the free trade agreement between the US and China is extended to include free trade in food (thus, in all goods). IF the equilibrium relative US to Chinese wage ( $W^{us}/W^c$ ) from part (ii) does not change, where will electronics be produced and how will this expansion of the free trade agreement affect labor demand in each country? **(7 points)**
  - iv. Use your answer from part (iii) to conclude how expansion of the free trade agreement affects the equilibrium relative wage ( $W^{us}/W^c$ ). Also, discuss: (i) what the pattern of trade in goods will be when all goods are traded; (ii) whether the expansion of the agreement to food raises world efficiency; and (iii) whether both countries necessarily benefit from this expansion of the trade agreement. Be as specific as possible. Carefully explain your answer. **(8 points)**
- (b) Consider a specific factor model for a small country (Honduras) which produces two goods (clothing, food). Each good is produced under constant returns to scale, using capital and labor. Since current capital (machines) in each sector is the result of previous investment decisions, capital is **not mobile** between sectors in the short run. However, labor is mobile between the sectors and in equilibrium it earns the same wage in each sector. Under free trade, the country exports clothing and imports food.
- i. Given the amount of capital in each sector, show how an export subsidy for clothing affects the real return to each factor in Honduras and the output of each good. Who gains and who loses as a result of this subsidy? Be specific. **(7 points)**
  - ii. Suppose that, over time, capital can be shifted from one sector to the other (due to depreciation, etc.) but the **total** capital stock stays fixed. Assuming that production of food is *capital-intensive* (as compared to clothing), discuss the *long-run* effects on output and factor prices of this export subsidy to clothing producers. **(7 points)**
  - iii. Compare your results from parts (i) and (ii). Are the output changes larger in the short run or long run? Is there a difference between which interest groups gain in the long run than in the short run? Be specific. **(8 points)**