

Final Exam (March 11 2020)

Instructions: You have 120 minutes to answer all the questions. The total number of points is 120, so the number of points per question also indicates how much time you should devote to that question.

Make sure your answers are legible and concise. Make assumptions if you need to and make sure to explain the intuition behind your results. If you get stuck with the math in the theoretical exercise, try to guess the answers to the remaining questions providing intuition.

I. Short Questions (30 points)

Determine whether the following statements are TRUE, FALSE or UNCERTAIN, and justify your answer in one paragraph. Grading will be based on the justification (not on the simple TRUE, FALSE, UNCERTAIN answer). Please be concise.

1. Intra-industry trade between two countries requires differences in comparative advantage. **(5 points)**

False. If there are increasing returns to scale, there can still be a motive for trade even if the two countries are identical. See slides 42–45 of `4_Increasing_returns`.

2. According to Amiti, Redding, and Weinstein (2019), the costs of 2018 U.S. tariffs have been evenly split between domestic consumers and foreign exporters. **(5 points)**

False. See slide 49 of `7_Trade_Policy`. The tariffs have been mostly borne by U.S. consumers.

3. According to the gravity model, the gains from trade are greater if the country's share of spending on its domestically-produced good is smaller. **(5 points)**

True. See the equation on slide 20 of `6_Gravity_model`.

4. For any voluntary export restraint, there is an import quota that has the same effects on prices, quantities, and government rents. **(5 points)**

False. The quota rents are administered by the foreign country in the case of VER and by the domestic country in the case of an import quota. The figure looks identical to the one discussed on slide 26 of `7_Trade_Policy` (in particular, prices and quantities are the same), but which government gets the rents is different.

5. Import tariffs lead to higher consumer prices. **(5 points)**

Uncertain. If the exporter does not change, this is generally true, except in the edge case where import demand is perfectly elastic or export supply is perfectly inelastic, where consumer prices will not change at all. This is the logic of the models we've seen in class. But remember, too, the real-world example of washing machines: when production abroad *relocates* to a lower cost location, then the (former) exporter will bear the full burden of the tariff. In this case the answer depends on whether or not there is tariff hopping.

6. After the US tariffs on solar panel imports the domestic prices of solar panels continued to fall, so the tariffs had virtually no effect on the consumers. **(5 points)**

False. While it is indeed correct that solar panel prices fell in the US after the tariffs, as was discussed in the last class in both sections, the prices in other countries fell more. Therefore it is likely that the solar tariffs indeed raised prices in the US relative to the counterfactual world of not having these tariffs.

II. Exercise (30 points)

1. In the case of the import restrictions on washing machines, what was the key difference of the 2018 restrictions from the earlier import restrictions in 2012 and 2016? **(5 points)**

Solution. The first two rounds were against selected countries only, the last round against virtually all countries exporting washers to the US.

2. See the following excerpt from the Wall Street Journal interviewing the CEO of Whirlpool, Marc Bitzer, in May 2019.

WSJ: The tariffs on your competitors have raised the price of some washing machines by \$80. That cost U.S. consumers an additional \$1.5 billion since the tariff took effect, according to recent estimates. Is that fair, that Whirlpool is benefiting while consumers are paying more?

MR. BITZER: Take any of our products, 60% to 70% of product cost is material cost. Over the last two years we had more than \$600 million in material-cost inflation. There's just not enough margin in our business to just absorb it. So we had to pass on that cost. So to now say, well the safeguard measures [tariffs on appliance imports] drove the price, is just not a reflection of reality, because we're material-cost driven. We would have raised prices with or without safeguard measures.

How does the research design in Flaaen, Hortaçsu, and Tintelnot (2020) account for the explanation for price increases on washing machines (and dryers) provided by the Whirlpool CEO? (5 points)

Solution. FHT use a *diff-in-diff* design (students don't need to mention that term). They look at the price changes in washing machines relative to those for other appliances, so common cost increases for materials used in all these appliances are differenced out.

3. Suppose you are invited as a trade expert to advise government leaders who propose leaving from a preferential trade agreement. Using the conceptual frameworks presented in this class, discuss both pros and cons of such proposals. (10 points)

Solution. There are lots of valid responses, so I won't attempt to be exhaustive. Here are a few pros and cons that were top of mind for me after skimming the slides.

- Pros of *leaving* PTA:

- eliminate trade diversion: “instead of gaining tariff revenue from inexpensive imports from world markets, a country may import expensive products from member countries but not gain any tariff revenue” (slide 93 of 7_Trade_Policy)
- may protect infant or imperfectly-competitive industries from foreign competition from within the PTA (slides 26 of 4_Increasing_returns and 94–96 of 7_Trade_Policy)

- Cons of *leaving* PTA:

- will become more costly to trade with members of the PTA, potentially over and above the addition of tariffs if, for instance, this PTA was a customs union (slide 92 of 7_Trade_Policy)
- may end up back in a Prisoner's Dilemma with PTA members (slide 76 of 7_Trade_Policy)

4. Indonesia and Malaysia together make up 85% of the global supply of palm oil. Suppose the government of Malaysia proposes an export tax on palm oil. Do you think such a policy would raise the aggregate welfare of Malaysia? Do you think the producers of palm oil in Malaysia will be in favor or against this proposal? (10 points)

Solution. Recall slide 30 of 7_Trade_Policy: export taxes *may* be welfare-enhancing. Malaysia is a large exporter of palm oil, so we'd expect world prices to respond to the tax. Domestic consumer prices fall and the government collects revenue, which can potentially offset the losses for palm oil producers, who would be **against** the export tax. (If you'd like to draw this out, the figure should look like that on slide 21 of 7_Trade_Policy but **flipped upside down.**)

III. Exercise (30 points)

The U.S. government is considering levying a specific-import tariff on Food and asks you as an expert to help with the analysis. The U.S. demand curve for Food is $D = 12 - 3P$ and the U.S. supply curve is $S = 2 + P$. The foreign demand curve for Food is $D^* = 9 - 3P$ and the foreign supply curve is $S^* = 3 + P$. Assume that the U.S. is large relative to foreign.

1. In the absence of a tariff, what is the world price for Food, and which country will export and which country will import Food? **(10 points)**

Solution. Notice that the slopes of both demand curves are equal, as are the slopes of both supply curves. Examining the intercepts of the supply and demand curves, then, a reasonable guess here is that the U.S. will import Food and foreign will export it. Let's guess and verify: foreign excess supply is $XS = -6 + 4p$; U.S. excess demand is $MD = 10 - 4p$. These cross at $p = 2$. At this price, the U.S. demands $D = 6$ and supplies $S = 4$, while foreign demands $D^* = 3$ and supplies $S^* = 5$. So the U.S. imports Food and foreign exports it, as we guessed.

Note: One could have also derived total world demand as $D^W \equiv D + D^* = 21 - 6p$ and total world supply as $S^W \equiv S + S^* = 5 + 2p$. This yields a world equilibrium price of $p = 2$. But we needed the excess supply and demand curves for the next question anyways, so we went ahead and used them above, too.

2. The U.S. is considering levying a small import tariff for Food. Label this specific import tariff as t . Show graphically how the domestic price and the foreign price will be affected. State the new domestic price and the new foreign price in terms of t . **(10 points)**

Solution. See the figure on slide 17 of 7_Trade_Policy. For this particular set of equations, we must have $10 - 4(p_T^* + t) = -6 + 4p_T^*$, so $p_T^* = (4 - t)/2$ and $p_T = p_T^* + t = (4 + t)/2$.

3. Will such an intervention increase or decrease the U.S. terms of trade? How will U.S. producer surplus and U.S. consumer surplus be affected? **(10 points)**

Solution. See the figure on slide 21 of 7_Trade_Policy. We'll use the labels from that figure to answer the question. Under the specific tariff t , the U.S. faces the price $p_T = (4 + t)/2$, so it demands $D_2 = 6 - \frac{3}{2}t$ and supplies $S_2 = 4 + \frac{1}{2}t$. Consumer surplus

drops by $a + b + c + d$, where

$$\begin{aligned}
 b &= \frac{1}{2}(p_T - p_W)(S_2 - S_1) = \frac{1}{2} \frac{t}{2} \frac{t}{2} = \frac{1}{8}t^2 \\
 a &= (p_T - p_W)S_2 - b = \frac{t}{2} \left(4 + \frac{1}{2}t\right) - \frac{1}{8}t^2 = 2t + \frac{1}{8}t^2 \\
 c &= (p_T - p_W)(D_2 - S_2) = \frac{t}{2}(2 - 2t) = t(1 - t) \\
 d &= \frac{1}{2}(p_T - p_W)(D_1 - D_2) = \frac{1}{2} \frac{t}{2} \frac{3t}{2} = \frac{3}{8}t^2
 \end{aligned}$$

which means

$$a + b + c + d = 3t - \frac{3}{8}t^2$$

Producer surplus increases by a . Tariff revenue is $c + e$, where

$$e = (p_W - p_T^*)(D_2 - S_2) = \frac{t}{2}(2 - 2t) = t(1 - t)$$

so

$$c + e = 2t(1 - t)$$

The rectangle e represents a terms of trade **gain** because the tariff lowers the foreign export price.

IV. Exercise (30 points)

Consider the specific factors model laid out in slides 8-15 of `5_Specific_Factors_Model`. For **any 3 of the following 4 statements**, prove that it is true or provide a counterexample. You may use graphical illustrations to support your argument either way.

1. If the two countries are identical, there are no gains from trade. **(10 points)**

Solution. This is **true**. For there to be strictly positive gains from trade in the specific factors model, relative prices must differ across countries. If the two countries are identical, however, the relative price ratios cannot differ.

2. An increase in the relative price of a good will increase the real return to the specific factor used to produce that good and reduce the real return to the other specific factor. **(10 points)**

Solution. This is (an adaptation of) the Stolper-Samuelson (1941) theorem, which was shown to hold in a two-good, two-factor model. Here we have *three* factors and two goods, nevertheless **we can show that it still holds**. A graphical proof can follow slides 34–37 of `5_Specific_Factors_Model`. An alternative proof (that students aren't

expected to know) is to totally differentiate the zero-profit condition of each producer and use the Jones algebra to write

$$\hat{p}_g = \theta_{gL} \hat{w} + \theta_{gG} \hat{r}_G$$

where G denotes the factor specific to good g , θ_{gF} is the cost share of factor F in production of good g (which sum to one across factors for each good), and carats denote percentage changes. Suppose that the price of cloth increases but the price of food stays fixed. Then

$$\begin{aligned} \hat{p}_c &= \theta_{cL} \hat{w} + \theta_{cK} \hat{r}_K \\ 0 &= \theta_{fL} \hat{w} + \theta_{fT} \hat{r}_T. \end{aligned}$$

We can deduce from positive but diminishing MPL that $0 < \hat{w} < \hat{p}_c$, so we must have $\hat{r}_K > 0$ and $\hat{r}_T < 0$. The same logic works if we consider a price increase for food instead.

3. An increase in a factor endowment will increase the output of the good using it intensively and decrease the output of the other good. **(10 points)**

Solution. This is the Rybczynski (1955) theorem, which was shown to hold in a two-good, two-factor model. But here we have *three* factors and two goods, and **we can show that it no longer holds**. Suppose that food production was more labor-intensive in the initial equilibrium, and consider an increase in the endowment of labor. With strictly positive but diminishing marginal products of labor in each sector, it cannot be that all of the new labor goes to food production; some will go to cloth production, too. With more labor in each sector and a fixed capacity of each specific factor, total production of both goods must increase.

4. For each factor, there must be a good such that an *increase* in the price of that good will *lower* the real return to that factor. **(10 points)**

Solution. This theorem is from Jones & Scheinkman (1977), who showed that it holds when the number of goods equals the number of factors. But here we have three factors and only *two* goods, and **we can show that it no longer holds**. Consider labor. For a small change in, say, cloth, the effect on real wages is ambiguous: real wages in units of cloth decrease (because the nominal wage increases by less than the price of cloth), but real wages in units of food increase (because the nominal wage increased but the price of food did not). So for labor there is no good for which an increase in its price would unambiguously lower the real return to labor (i.e., the real wage).