Problem 1. *Suppose country A is rich in high skill labor, and country B is rich in low skill labor. Currently they both live in autarky.*

a) *What would be the effect of free trade in these countries in terms of welfare? Assume for simplicity that each resource (high skill/low skill work) can be used to create one different good) To fundament your answer, use model(s)we covered.*

I start by establishing the autarky state of both countries. For simplicity, I call the good produced by high skill labor *x* and the good produced by low skill labor *y*. We see that we have 2 countries, A and B, 2 goods, x and y, and 2 factors of production, high and low skill labor. I will use the stand model of trade to answer these questions, unless otherwise specified.

To explain it briefly, country A which is relatively abundant in high skill labor will be able to produce more of good x than good y. This will give us their production possibility frontier, which represents all combinations of x and y the country can produce. Since the countries are in autarky, their production will have to equal the consumption in their own country. The optimal consumption is found by the highest indifference curve. The indifference curves represent all combinations of x and y for which consumer are indifferent. The higher the curve, the more "welfare" for the consumers. The tangent of the PPF at the intersection with the indifference curve gives us the relative prices in that country.

The opposite will be true for country B which leads us to these autarky production situations.
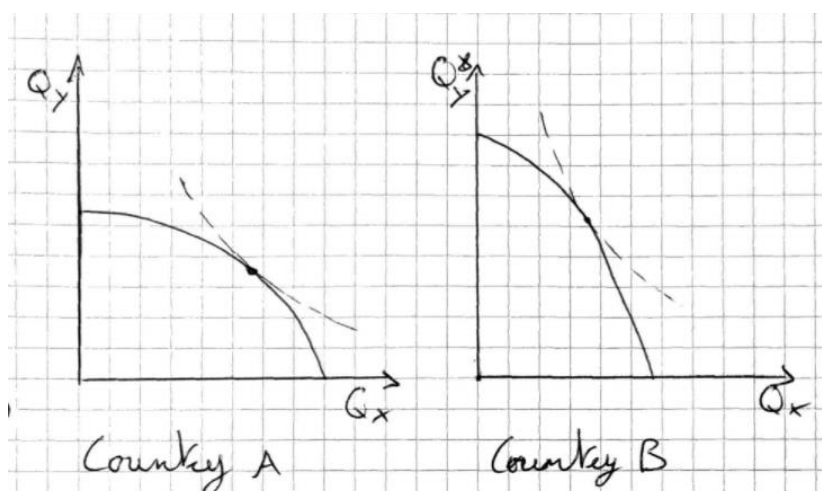
To analyse how this production will change with trade, I will establish the world relative supply and demand. I assume the demand to be the same in country A and B and that they are of almost equal size. Given these assumptions, the world relative demand will be the same as

the relative demand in either country and the relative supply will be between the relative supply of country A and B.

We see from the graph that the new world relative price will be higher for country A and lower for country B. We can plot this:
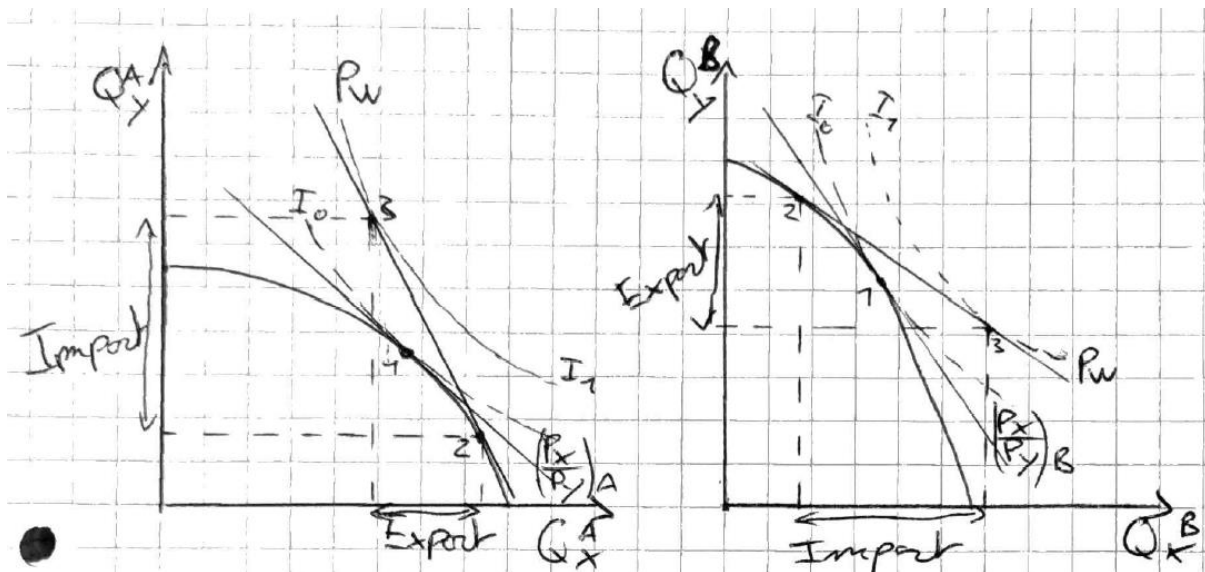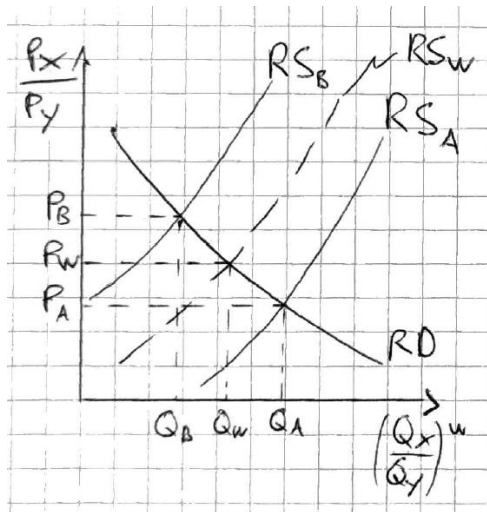
The new world price will move production to point 2. At that price, consumption can reach a new indifference curve that is higher than it was under autarky, I0->I1. The countries will consume at point 3 but produce at point 2. The difference is either exported or imported. Since we are looking at only these two countries, the export of country A will equal the import of country B and vice versa. This is not visible in the model due to drawing inaccuracies.

We see that the effect of free trade under the current assumptions lead to increased consumption possibilities for both countries thereby increasing their welfare.

b) *How would free trade impact wealth distribution for country A? Again, use a model learned in class to argue your points.*

The standard trade model used in a) shows us that for both countries, welfare will increase. It does not however make explicit predictions about how this welfare is distributed inside the countries. Assuming that there is no profits and that workers get paid equal to the value they bring, an increase in price leads to an increased income. We see that, in country A when trade is introduced, the relative price of y falls. The produced amount of good y falls as well, this leads to a fall in income for low skill laborers. The model shows that the increase in welfare for high skill laborers makes up for the fall for low skilled laborers as well as increase total welfare. This shows us that if the increased welfare were distributed to compensate losing workers, trade would benefit everyone, but it is not likely to happen.

The opposite would be true in country B, low skill workers get increased welfare and high skill labor lose.

This allows us to formulate the impact of free trade. We can predict that when we open for trade the owner of the factor, which is used in the export production, gets increased income while the owner of the other factor gets a lower income. This is predicted by the Stolper-Samuelson effect which predicts that when the relative price of a good increases, which happens with trade, the factor used in the production of that good gets increased real income, while the owner of the other factor gets decreased real income.

This can also be shown using the Hecksher-Ohlin. Though it might not be completely adjusted to the case it can be useful. Assume no profits and therefore a linear relation between price of good and wages of factor used. We allow for substitution and say that as the wage of high skill labour increases, the use of high skill labour decreases. We assume that the production of good x is high skill labour intensive, at any given level of relative wages, they will use high skill labour in the production of x than in y. We can then illustrate it like this:
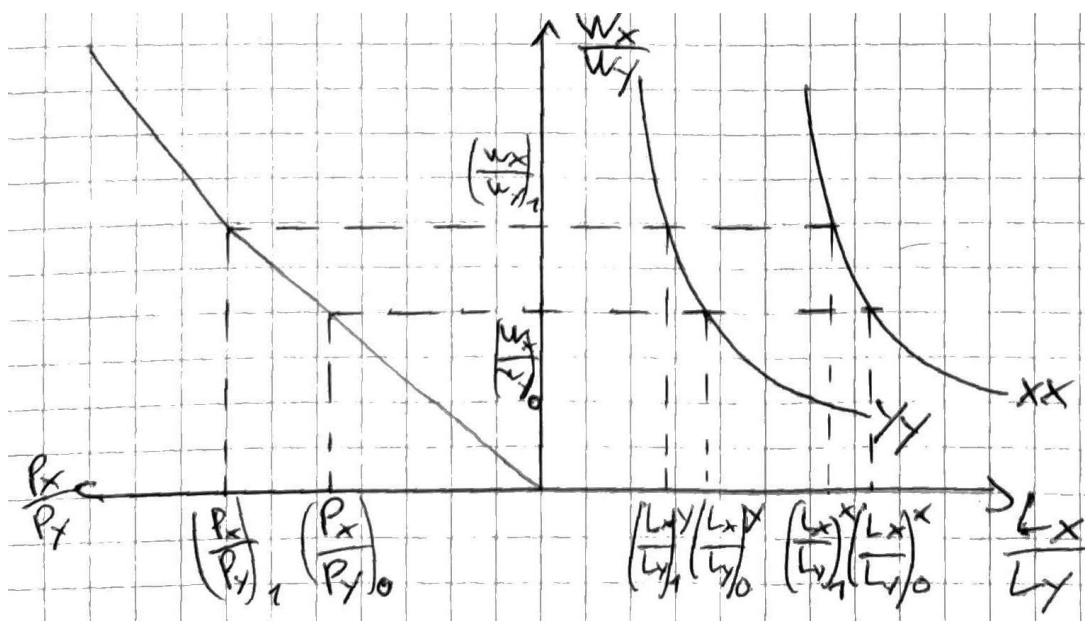
We can see that as the relative price of x increases when opening for trade, the relative wage for high skill labour increases and relative use of high skill labour falls in both industries.

We can then show mathematically that as relative high skill wages increase, the real income of high skill workers increase. If the relative wages for high skilled workers increase, the real income of low skill workers fall.

This is another way to show the Stolper-Samuelson effect.

c) *A shock makes the good intensive in high skill labor scarcer in the global market. What happens with the terms of trade for country A? and for country B?*

The terms of trade are the value of exported goods divided by the value of imported goods. An increase in the terms of trade increases welfare for the country.

I will assume the shock happens outside the model and does not imply changes in the PPF for either country or changes in the relative demand. If good x becomes relatively scarcer on the world market, we see from the world relative supply and demand that the relative price of good x increases. This will lead to a shift in the world relative price to the left. This means that the world relative price for x increases.
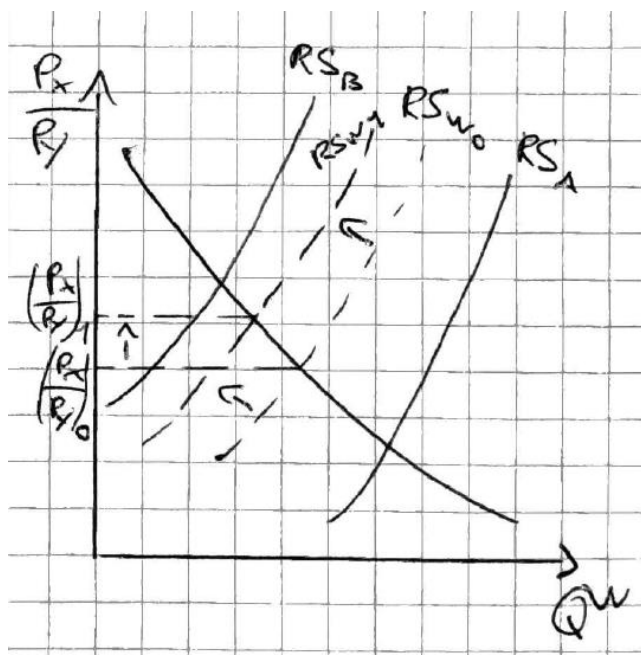
The terms of trade for country A are the relative price of x. Since this is increased by the shock, the terms of trade are increased and the welfare in country A is increased. This will lead to further specialization in good x and reaching a higher indifference curve.

The terms of trade for country B are the relative price of y, the inverse of the relative price of x. The shock leads to this decreasing and thereby decreasing the terms of trade of country B. Country B will produce relatively less of good y and suffer a loss on welfare.

d) *Suppose country A establishes a tariff on imports from country B. Who in country A would benefit from this tariff (low skill workers or high skill workers)? Show the effects of the tariff using what you learned in class*

In this question I will assume that both country A and B are small and have no impact on the world relative price. This means that I will not analyse the effect of the tariff on terms of trade, because I assume that they do not change. I will explore this idea in problem 2

If country A introduces a tariff on imports from country B, this means tariffs on good y. This will mean that the world relative price will no longer be the internal relative price in country A. In the standard trade model, this will mean a shift is relative price and therefore achievable indifference curves. Call relative prices P and the shift from P0 to P1. This leads to total welfare falling from I0 to I1.
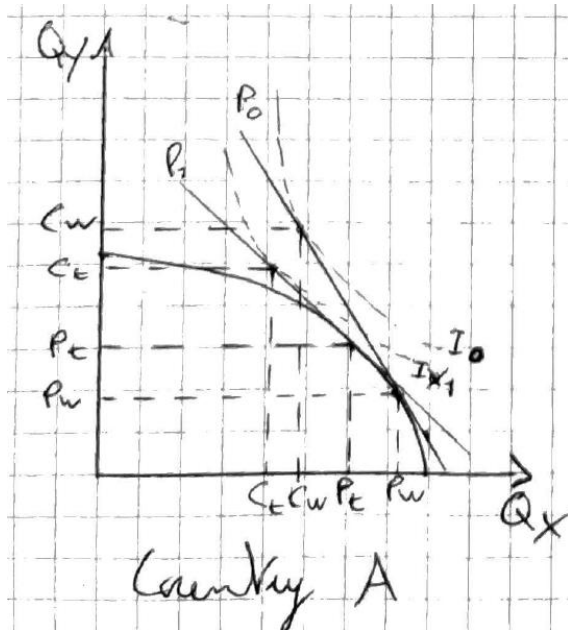
This does not tell us the effect on each factor owner, but shows us that in total, the tariff will not benefit country A.

In the model I have also illustrated the shift in production and consumption of each good due to the tariff. Start with good x, the production at world relative price is Pw and the consumption is at Cw. At the new relative after tariffs, production is at Pt and consumption is at Ct. The effect of consumption is clear, the tariff decreases consumption possibilities. It is unclear whether total exports (Pw-Cw) fell because of tariffs, but we know that good x is sold at a lower price. The effect on welfare is also negative. Now looking at good y. Total consumption falls as a result of the tariff, but the production is increased. The imports (C-P) have decreased. For producers of good y, the quantity sold as well as the relative price of y has increased. Leading to increased income for producers of good y.

We see from this analysis that consumers as well producers of good x, real income will fall. The producers of good y, however, will gain from the tariff. This corresponds with the previously mentioned Stolper-Samuelson effect.

e) *Suppose there are very important economies of scale involved in producing goods that are intensive in low skill labor. Show why a tariff might end up being ineffective in increasing home production in this case.*

I assume we are looking at external economies of scale. If an industry has external economies of scale, it means that as production increases in the industry, the cost per unit will fall. The fall in price is affected by the total size of the industry not the size of the firm. There are few reasons that this concentration will occur and lead to lower costs, such as specialized suppliers, workforce pooling and knowledge spillovers. Workforce pooling seems like the most relevant, so I will explain it some detail and ignore the others.

The advantage off pooling is that if a low skill factory producing y wants to open, it might beneficial to open in the same area as another factories producing y. This way, low skill workers who know how to make product y will concentrate in that area. This leads to less risk for producers, they are more likely to find the right workforce, and workers who are more likely to find a job.

We can assume that cost of producing a unit of y is very low in country B. We predicted in d) that a tariff on imports of y from country B would lead to some of the production shifting to country A, but that might not be the case. If the price of good y in country B is lower than the price in country A even accounting for the tariff, production will not move. Can be shown graphically, assuming demand for good y to be equal in A and B, even if the country A would be able to produce y at an even lower price (not a reasonable assumption giving what we know).
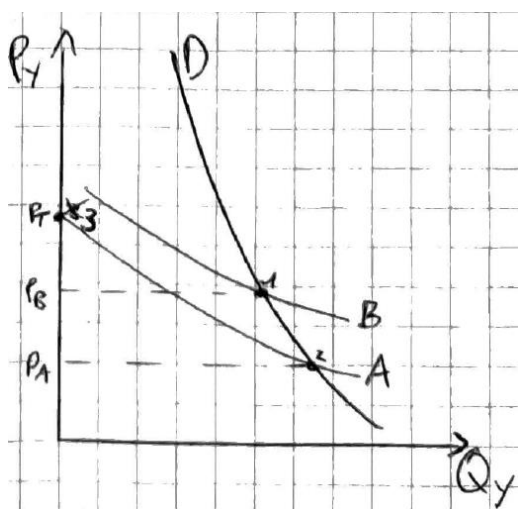
Country B supplies global demand a point 1 with price PB. If country A were to suddenly be able to fulfil global demand, they would produce at price PA<PB. For now the y can only produce at PT>PB, therefore they do not produce. This model assumes perfect specialization (country B produce all global production of y), country A is currently outside the market for good y. If they introduce a tariff t to the price of PB, as long as PB+t<PT, country A will still not be able to increase their production in good y. Since the problem stated there are very important economies of scale in the market, the tariff would need to be large.

This analysis concludes with full specialization, which we do not see in the world market, and even assumed that country A would be more efficient in production of good y, which is not realistic given that they are relatively scarce in the necessary factor of production. It is therefore very possible that an increase in tariff would not lead to increased production of y in country A due to external economies of scale.

Problem 2. *A lot of debate was raised by the decision of the US Government (Trump administration) of introducing retaliatory tariffs against countries that they perceived behaved unfairly, most notably China. Explain all the reasons why this could be a good policy from the perspective of the US. You should use what we have discussed in class, but not limit yourself to it. Remember both China and the US are real countries that will be with us for a long long time.*

I will discuss this issue using to goods representing exports and imports between China and the US. US imports Phones (P) and exports soy (S).

The US is a big country, as mentioned in 1d), this means that changes in their imports and exports lead to changes in global relative prices. Will start by looking at the effect of a tariff on phone imports in a trade market of phones. The US passes a tariff t on phones. This leads to a decreased demand for phones in the US. Because they are a big country, this leads to global relative demand for phones falling and as a result, prices for phones fall as well. That means that the effect of the tariff on price in twofold, it increases price in US by t, but reduces global prices and therefore internal prices as well. We can still reasonably assume that the total effect on price in positive. Can be shown graphically:
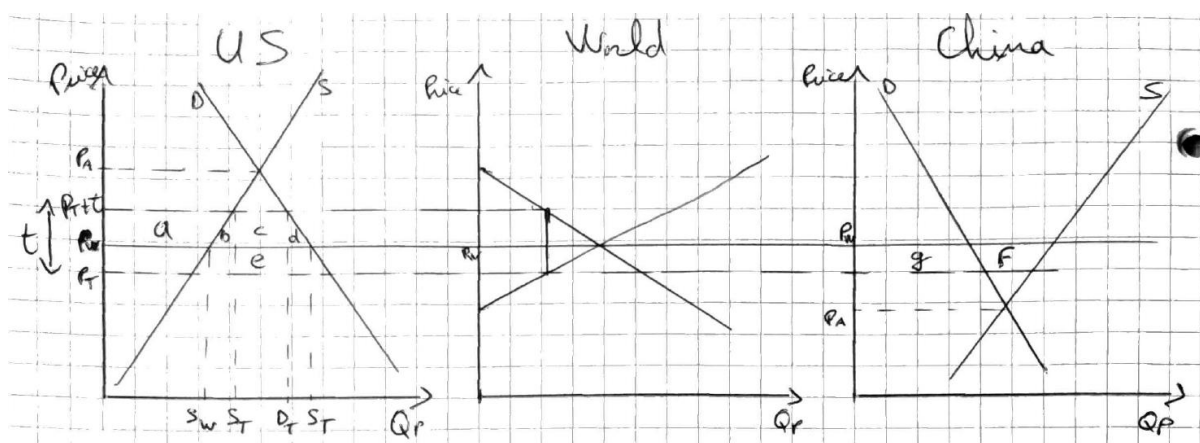
PA is the price in autarky and PW is the price in the world market without tariffs. When the US employs tariffs, the world price falls down to PT due to decreasing demand, and the price with tariffs is found by adding the tariff sum t. As a result, domestic supply of phones in the US has increased and demand has decreased, reducing imports from China.

The total cost of the tariffs can be found by finding all individual costs for producers, consumers and the state. Since production has increased and is at a higher price, producers gain area a. Consumers buy less and at a higher price, their loss is a+b+c+d, incurring both a negative income shift and a consumption distortion. The state gains the tariff imports, so the benefit is the area c. Due to decreased global price, the US gain increased terms of trade and the result is benefit of area e. The total cost of the tariff is therefore b+d-e. If we could show that that e is bigger than b+d, the net cost of the tariff would be negative and therefore benefit the US. This terms of trade benefit is only possible because the US is a large country.

China on the other hand would suffer a loss for producers equal to g+f and consumers would win g. The total effect would be a cost of f.

If we stopped here, the tariff might seem like a good idea for the US. But the implementation of a tariff on a country only leads to a tariff being placed back. This was the case as China introduced a tariff on US soybeans. Since China also is a big country, they could also potentially benefit from the tariff and the US would now suffer the loss of f. The total cost would now be b+d+f-e, this is less likely to be positive.

Therefore, by introducing the tariff on Chinese phones, the US could lead to a net gain if China does not respond, but also loss for both countries if they both have tariffs. Can be explained as the prisoner's dilemma.

If the choice is over one period only, none of the countries want to risk losing a lot by not having tariffs. But if we assume multiple periods with choices, both countries would be better off. This possible trade war and disregard for agreements of free trade might further damage trust and increase use of trade barriers globally.

Another argument for the use of tariffs by the US is the infant industry argument. By protecting the phone sector, US companies might improve their production and reduce costs. When the tariff is removed, the US phone industry can compete, and US welfare is increased. Can be illustrated by a positive shift in the supply curve from S0 to S1 in the US market.
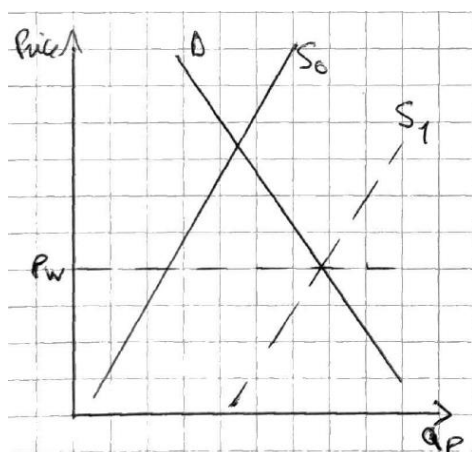
This is plausible if we assume that the market either has external economies of scale (analysed in 1e)) or there is learning by doing in the market such that marginal cost fall over time. If the cost falls enough, US could even turn into an exporter. There is however no guarantee that this will happen, nor that the benefits will outweigh the costs.

China does not only export phones, but also low skill manufactured goods to the US. As we saw in problem 1, this leads to low skill workers losing because of trade. A tariff could be

used to protect these sectors at the expense of consumers and other producers. I explained how this worked in 1 so I will rather discuss whether it is a good argument to use a tariff.

We discussed that while the welfare of individuals might fall, the total welfare will increase. If we were to distribute this income more evenly, everyone would be better off. The case for tariffs in this situation is that income cannot be distributed, therefore, to ensure more even wages, the best way is to protect these industries. Intuitively, trade policy does not seem like the best way to deal with internal wage distribution. I can think of better ways, like taxes on income and stronger unions. However, in the absence of these options, tariffs will be able to ensure that industries in the import sector do not lose too much.

A political reason for tariffs cited by the US is the fear of surveillance by the Chinese government through Chinese phones. This can be a valid reason but given that it is difficult to prove or disprove, it is unclear whether it is an actual motivation or an excuse.

Another political concern is the unsure working conditions of Chinese workers in, for example, phone factories or the possibility of forced labour in the Xinjiang province. This might be a moral motivation for introducing trade barriers, though I doubt they are a primary concern.

In conclusion, due to the US being a large country with an influence on global supply and demand, there might be gains from tariffs. These seem to be undermined by the risk of retaliation by China and other countries. It could also alleviate unequal income distribution by protecting vulnerable industries. There are political reasons, such as surveillance and human rights, as well.