Economics 39F: Final Exam

Please be concise and to the point. Print your name on your exam and turn it in with your blue books. You have 3 hours (but I doubt you will need it). The exam has 100 points. Answer all 3 questions. You should spend the first 10 minutes reading the exam. Good luck!

1. (50 points) A few weeks ago, the New York Times ran an article reporting that the WTO had just authorized the US to impose tariff retaliation against the EU for the EU’s WTO-illegal program of production subsidies offered to its major aircraft maker Airbus. As the Times article noted:

“The World Trade Organization’s decision brings to an end a roughly 15-year dispute over the financial assistance that Europe provides to its major plane maker. The organization ruled last May that Europe had illegally subsidized several of Airbus’s models. On Wednesday morning, the global trade body announced that the United States could seek to recoup $7.5 billion in damages by imposing tariffs, the largest authorized retaliation in the organization’s history.

The Office of the United States Trade Representative said that it plans to levy a 10 percent tariff on European aircraft and a 25 percent tariff on agricultural goods, industrial products and other imports in an effort to pressure the European government to abandon its subsidies.

“For years, Europe has been providing massive subsidies to Airbus that have seriously injured the U.S. aerospace industry and our workers,” Robert Lighthizer, the United States trade representative, said in a statement. “We expect to enter into negotiations with the European Union aimed at resolving this issue in a way that will benefit American workers.”

You have been hired by Robert Lighthizer as a winter intern to help him resolve the US-EU trade dispute “in a way that will benefit American workers.” In particular, Mr. Lighthizer believes that, with the threat of large US tariffs hanging over the EU, he can negotiate a deal under which the EU will agree to remove its production subsidies to aircraft. He is interested in how the removal of the EU production subsidy will impact US workers in the short run and in the long run in a setting where the US and EU aircraft industries are competing to export to third-country markets, and he is also interested in how overall utility in the US and in these third-country markets (the non-EU rest of the world) will be impacted. To help Mr. Lighthizer, please answer the following:

a) First, use the 3-country (EU, US, ROW) 2-good Basic Trade Model, with the EU and US exporting aircraft to ROW and importing clothing from ROW, and with the EU initially imposing a production subsidy on aircraft and the US and ROW adopting free trade policies, to determine how overall utility in the US and the ROW will be impacted by the removal of the EU production subsidy to aircraft, illustrating the impact on each of these countries in monetary terms by depicting the equivalent variation.

b) Second, focusing on the US, and assuming that in the short run the US economy is a Specific Factors economy with some capital specific to the aircraft sector, some capital specific to the clothing sector, and labor (workers) mobile between the two sectors, determine whether the real wage of labor will in fact rise in the US in the short run as Mr. Lighthizer hopes after the removal of the EU production subsidy to aircraft.

c) Third, focusing again on the US, and assuming that in the long run the US economy is a Heckscher-Ohlin economy with capital and labor both mobile across sectors and with aircraft the capital-intensive good and clothing the labor-intensive good, determine whether the real wage of labor will in fact rise in the US in the long run as Mr. Lighthizer hopes after the removal of the EU production subsidy to aircraft.
2. (30 points) Using the Continuum-of-Goods Ricardian Trade Model with the fraction $k<1$ of income spent on traded goods and the fraction $(1-k)$ spent on non-traded goods, show that immigration of foreign labor to the domestic country will improve the competitiveness of the domestic country but reduce the real wage of its native workers. Then show that if the foreign country makes a transfer of purchasing power to the domestic country in the right amount, both of these effects can be avoided – that is, both the competitiveness of the domestic country and the real wage of its workers (not counting the direct benefit they will get from the transfer itself) will remain unchanged.

3. (20 points) Earlier this year, the Washington Post ran an article with the title “Help wanted: Rural America needs immigrants,” which began as follows:

   “President Trump argues that keeping immigrants and refugees out of our country is a matter of vital national security. He has made it his campaign thesis and shut down the government over it. Here in Storm Lake, Iowa, where the population is about 15,000 and unemployment is under 2 percent, Asians and Africans and Latinos are our lifeline. The only threat they pose to us is if they weren’t here. That’s been the case for years all over rural Iowa and southern Minnesota, in the heart of the Corn Belt, where anyone who wants a job cutting hogs or laying block or working as an orderly can get one. One part of the rural condition in American today is that, after college, our young people go to Des Moines or some city beyond for a job in finance or engineering that simply doesn’t exist in the old, county-seat towns of 5,000 people. As rural counties are drained of young people with higher educations, immigrants flow into the vacuum. The influx began 40 years ago and continues today.”

Let’s use the Specific Factors Model to explore why “rural America needs immigrants.” In particular, suppose Corn farms are located in Storm Lake and the Finance industry is located in Des Moines, and that these two locations and industries represent the US economy, which we will assume for simplicity is small in world markets. Suppose further that Land in Storm Lake is specific to Corn, Skilled Workers in Des Moines are specific to Finance, and (unskilled) Labor is mobile between Corn and Finance (and hence mobile between Storm Lake and Des Moines).

Now suppose that some of the Labor living in Storm Lake and working the Corn fields decides to go to college, get a degree in Finance and become a Finance-specific Skilled Worker and move to Des Moines, increasing the supply of Finance-specific Skilled Workers there (and hence shifting up the MPP of Labor curve in the Finance sector) and decreasing the US supply of Labor. Show first that this will cause the population in Storm Lake to decline, and that it will cause the real income of Land owners in Storm Lake to decline as well. Then show that if immigration is allowed to augment the US supply of Labor, this will increase both the population in Storm Lake and the real incomes of Storm Lake Land owners, but it will decrease the real wage of the native Labor that had remained in Storm Lake (as it will the real wage of native Labor across the US).

**Extra Credit** (5 points) Pose a question on a trade policy topic that your grandmother might ask you at the Thanksgiving dinner table this Thursday, and provide an answer that, while supported by the models we have covered in Econ 39 this Fall, you have translated into words and intuitive explanations that your grandmother could appreciate without having taken Econ 39 herself.
1. We are told that Mr. Lighthizer believes he can use the threat of WTO-sanctioned retaliatory tariffs against EU production subsidies to its aircraft industry to negotiate a settlement with the EU where the EU removes the subsidies. We are asked to consider how the removal of the EU production subsidies to aircraft will impact US workers in the short run and in the long run, as well as overall utility in the US and in the non-EU rest of the world as measured by equivalent variation. The specific questions come in three parts:

A) We are told to use the 3-country (EU, US, ROW) 2-good (aerial vessel exported by EU and US in exchange for imports of clothing from ROW) Basic Trade Model to assess the impact of the removal of the EU production subsidy to aircraft on US and ROW overall utility as measured by equivalent variation. The graphs on the following page depict the answer, under the assumption that goods are normal in consumption.
The top left figure shows what happens to EU exports of aircraft at fixed world prices when the EU removes its subsidy to the production of aircraft. EU production of aircraft falls and, under the normal goods assumption, EU consumption of aircraft rises, hence $E_a = P_a - C_a$. 
This inward shift of the world export supply of aircraft is depicted in the bottom right figure, and it leads to a rise in world prices from \( \left( \frac{P_a}{P_c} \right)_0 \) to \( \left( \frac{P_a}{P_c} \right)_1 \).

As depicted in the top right figure, the increase in the world relative price of aircraft is good for the US, an exporter of aircraft, and the equivalent variation labeled \( EV^0 \) in that figure is a monetary measure of the gain in real GNP for the US. However, as depicted in the bottom left figure, the increase in the world relative price of aircraft is bad for the ROW, an importer of aircraft, and the equivalent variation labeled \( EV^0 \) in that figure is a monetary measure of the loss in real GNP for the ROW.

b) We are now told that in the short run the US is a specific factors economy with some amount of capital specific to the aircraft sector and some amount of capital specific to the clothing sector, and with labor (workers) mobile between the two sectors. We are asked to determine whether the real wage of labor will in fact rise in the US
in the short run as Mr. Lighthizer hopes after the removal of the EU production subsidy to aircraft.

We know from part (a) that the removal of the EU production subsidy will cause \((\frac{p_0}{p_{ci}})\) to rise. Let's normalize \(\Delta p_{cl} \equiv 0\). Then we know that \(\Delta p_{w} > 0\). The figures below show what happens to the US market.

As the figures above depict, in the short run the impact of the removal of the EU production
Subsidy to aircraft is to lower $\frac{w}{pa}$ in the US and raise $\frac{w}{p_{CI}}$. Hence, if US workers spend a large enough share of their income on clothing, then the real US wage $\frac{w}{cpi}$ will rise. However, if US workers spend a large enough share of their income on aircraft, then the real US wage $\frac{w}{cpi}$ will fall.

c) We are now told that in the long run the US is a Heckscher-Ohlin economy with capital and labor mobile across sectors and with aircraft the capital-intensive good and clothing the labor-intensive good. We are asked to determine whether the real wage of labor will in fact rise in the US in the long run as Mr. Lighthizer hopes after the removal of the EU production subsidy to aircraft.

Letting a "\( n \)" denote a percentage change, we know from the above that

$$\hat{p}_a > 0 = \hat{p}_w.$$  

The following page shows that $\hat{w} < 0$, and hence we have $\hat{w} < 0 = \hat{p}_w < \hat{p}_a$. The US real wage falls when the EU production subsidy
As depicted, the rise is \( \text{pw} \) shifts in the unit-value is exact for aircraft in the US, and to maintain 2010 profits in both the US aircraft and the US clothing sectors, the unit-iso-cost line must shift as depicted, implying \( \hat{\omega} < 0 \) and hence \( \hat{\omega} < 0 = \hat{p_c} < \hat{p_a} \).
2. We are told to use the Continuous-Flow Ricardian Trade Model with the fraction \( k \) of income (everywhere) spent on traded goods and the fraction \( (1-k) \) spent on non-traded goods and to show that immigration of foreign labor to the domestic country will improve domestic competitiveness but reduces the domestic real wage of native workers. The figure below depicts the impact of the immigration on the relative wage \( \frac{W}{W^*} \) and domestic competitiveness as summarized by the marginal good \( \bar{z} \).

Letting \( L_0 \) be the amount of foreign labor emigrating to the domestic country, we then have

\[
L_1 = L_0 + I \quad \text{and} \quad L_1^* = L_0^* - I \quad \text{implying}
\]
that \( \frac{L_1^*}{L_0} \) and shifting the \( B(\bar{z}) \) curve down with immigration. As the Figure depicts, this implies that \( \bar{z} \) rises (a rise in competitiveness for the domestic country) and \( \frac{w}{w^*} \) falls. To confirm that the domestic real wage falls, we consider 3 representative goods, as labeled in the Figure:

\[ Z' \in \mathbb{Z} \]: \( \frac{W_0}{p(z')} = \frac{W_0}{\omega l(z')} = \ell(z') \]

\[ Z'' \in \mathbb{Z}, Z' \]: \( \frac{W_0}{p(z'')} = \frac{W_0}{\omega l^*(z'')} = \ell^*(z'') \]

\[ Z''' \in (\bar{z}, \bar{z}) \]: \( \frac{W_0}{p(z'''')} = \frac{W_0}{\omega l^*(z''')} = \ell^*(z''') \]
Hence, the competitiveness of the domestic county improves ($\bar{z}$ rises) but the domestic real wage of native workers falls as a result of immigration from the foreign county.

We are next asked to show that if the foreign county makes a transfer to the domestic country in the right amount, both the competitiveness of the domestic county and the real wage of its workers (not country the direct benefits of the transfer) will remain unchanged. The figure below illustrates the transfer level that achieves this.

\[
\begin{align*}
B_0(\bar{z}) &= \frac{\delta(\bar{z})}{1 - \delta(\bar{z})} \frac{L_0}{L_0} \\
B_2(\bar{z}) &= \frac{1 - k_x}{1 - k_x} \frac{1 + \frac{1}{k_x} \delta(\bar{z})}{1 - k_x(\bar{z})} L_i \\
\beta_1(\bar{z}) &= \frac{\delta(\bar{z})}{1 - \delta(\bar{z})} L_1 \\
A(\bar{z}) &= \frac{L_i - \delta(\bar{z})}{L_i}
\end{align*}
\]
The figure above reproduces the impact of immigration alone as the shift from $B_0(z)$ to $B_1(z)$. And then a transfer $\hat{T}$ is chosen so that

$$\frac{\hat{w}(\hat{z}_0)}{\hat{w}_0} \frac{L_0^*}{L_0} = \frac{1 - k}{1 - \hat{w}(\hat{z}_0)} \frac{\hat{T}}{\hat{w}_0} + \frac{\hat{w}(\hat{z}_0)}{\hat{w}_0} \frac{L_1^*}{L_1},$$

where $\hat{T} = \frac{\hat{T}}{\hat{w}_0}$. Solving for $\hat{T}$ yields

$$\frac{\hat{T}}{\hat{w}_0} = \hat{w}(\hat{z}_0) \left[ \frac{L_0^*}{L_0} - \frac{L_1^*}{L_1} \right] x_1 \frac{L_1}{1 - k} > 0.$$

So a transfer from the foreign to the domestic country in the amount $\hat{T}$ defined above then shifts the $B(z)$ curve from $B_1(z)$ when there is immigration and no transfer to $B_2(z)$ as pictured when there is immigration and a foreign transfer $\hat{T}$. As the figure shows, $\hat{T}$ is chosen to position the $B_2(z)$ curve so that $\hat{z}_2 = \hat{z}_0$ and $\hat{w}_2 = \hat{w}_0$, implying no change in domestic competitiveness and no change in domestic real wage (not counting the direct benefit of the transfer) either.
3. We are asked to use the Specific Factors Model to explore why "rural America needs immigrants." We are told to treat the US economy as a small open economy consisting of 2 locations, Storm Lake and Des Moines, with Storm Lake producing Corn using a specific factor -- Land in Storm Lake -- and a mobile factor -- (unskilled) Labor, and with Des Moines producing Finance using a specific factor -- Skilled Workers in Des Moines -- and the mobile factor -- (unskilled) Labor. Hence, Land is the factor specific to Corn and located only in Storm Lake. Skilled Labor is the factor specific to Finance and located only in Des Moines, and (unskilled) Labor is the mobile factor that can move freely between Storm Lake and Corn on the one hand, and Des Moines and Finance on the other.

We are first asked to show that, if some of the Labor working in the Corn sector and living in Storm Lake goes to college, gets a degree in Finance, and moves to Des Moines to join the Finance industry as a Skilled Labor input thereby increasing the supply of Finance-specific skilled labor in Des Moines and reducing the
Suppose the mobile factor labor, the result will be a decline in the population of Storm Lake and a fall in the farm income of Storm Lake land owners. The two figures below demonstrate that this will be so.
As the figures above depict, the reduction in the supply of labor in the US shifts the VMPE schedule in toward the left as the horizontal dimension of the top figure shrinks, and the simultaneous conversion of this labor to skilled labor specific to finance shifts up the VMPE schedule and hence shifts up the VMPE = PF * MPPE schedule, as shown. This implies a drop in labor employed in the corn sector, Li < L0, and hence, with the population of Storm Lake landowners fixed and the population of Storm Lake labor working in the corn industry reduced, we have a fall in the Storm Lake population. The bottom figure shows that the rents earned by Storm Lake land owners, measured in units of corn, also fall, and since the prices Pf and PC are unchanged, the real income of Storm Lake land owners also falls.

Finally, the figures on the following page show that if immigration is allowed to augment the US supply of labor while the above changes are happening, the immigration will increase both the population of Storm Lake and the real incomes.
of Storm Lake landowners, but will decrease the real wage of native labor that had remained in Storm Lake (as it will the real wage of labor across the US).

Gain of land rents measured in corn (rise in \( \frac{cG}{p_{Es}} \)).
With "1" labeling the outcome from the earlier figures, the figures above depict the impact of the increase in $L$ ($\Delta L > 0$) implied by immigration. As depicted, the horizontal dimension of the top figure now expands leading to a rightward shift of the right axis and an accompanying horizontal rightward shift of the VMP curve. The result is an increase $L'c$ ($L' > L$), which implies an increase in the population of Storm Lake as immigrants arrive to help produce Corn. As the bottom figure shows, this implies a rise in the income of Storm Lake land owners measured in Corn ($\frac{EC}{PC}$) and therefore a rise in the real income of Storm Lake land owners since prices $PC$ and $PS$ do not change. Finally, that the real wage of Labor Falls (everywhere in the US, including in Storm Lake) can be confirmed by the top figures by noting that $W$ falls ($W1 > W2$) while prices $PC$ and $PS$ do not change.