Assignment # 2

Due October 19 (beginning of class)

Problem 1

Argentina produces woolen products and fish in the framework of the specific factor model. In producing woolen products, Argentina uses a variable factor (labor, denoted \( L_w \)), and prairies/meadowlands for grazing, which are only usable for the woolen product sector (denoted \( K_w \)). For fishing, Argentina needs labor (denoted \( L_F \)) and specific types of capital, including boats and sea (denoted \( K_F \)).

Consider the following production functions for woolen products (W) and for fish (F), given the amount of specific factors (you may assume that all the data are in millions, but do ignore the millions in your answers).

<table>
<thead>
<tr>
<th>( L_w )</th>
<th>Boxes of wool</th>
<th>( L_F )</th>
<th>Boxes of fish</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>20</td>
<td>1</td>
<td>30</td>
</tr>
<tr>
<td>2</td>
<td>34</td>
<td>2</td>
<td>42</td>
</tr>
<tr>
<td>3</td>
<td>42</td>
<td>3</td>
<td>51</td>
</tr>
<tr>
<td>4</td>
<td>48</td>
<td>4</td>
<td>57</td>
</tr>
<tr>
<td>5</td>
<td>50</td>
<td>5</td>
<td>60</td>
</tr>
</tbody>
</table>

a. Construct below the production function for each industry.
b. If the total labor force in Argentina is 5 million, fill the table below showing the production possibilities (assume full employment). Use the data provided above.

<table>
<thead>
<tr>
<th>Possible allocation of labor</th>
<th>Production possibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lw</td>
<td>L_F</td>
</tr>
<tr>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>0</td>
</tr>
</tbody>
</table>

c. Use the four-quadrant framework below to illustrate how the allocation of labor between the two sectors determines the various production possibilities. Label the axes.

![Production Possibilities Frontier (PPF)](image)
d. Determine the actual allocation of labor. First fill in the following table to construct the MPL curves for each industry.

<table>
<thead>
<tr>
<th></th>
<th>Wool sector</th>
<th>Fishing sector</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lw</td>
<td>MPL_W</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>---</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>20</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
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<tr>
<td>3</td>
<td>3</td>
<td>8</td>
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<tr>
<td>4</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>2</td>
</tr>
</tbody>
</table>

Assuming that in autarky P\_W = 3 and P\_F = 10 ARS (Argentine Pesos), determine the allocation of labor between the two industries and the equilibrium wage.

\[ Lw = \quad 1, \quad L\_F = \quad 4, \quad \text{and} \quad w = \quad 60. \]

Given this allocation, what are the quantities produced?

20 boxes of wool, and 57 boxes of fish.

Show on your four-quadrant graph in part c, the equilibrium allocation of labor and the corresponding levels of production (report the numbers). ➔ point E in the diagram

e. Use the axes below to draw the labor demand curves in the two industries (lable your curves ). Show the allocation of labor and the equilibrium wage in autarky. (Fish on the left and wool products on the right.)
f. In the world market, wool products are sold at twice as much the price than in Argentina, while the price of fish is 60% cheaper (= 4 ARS).

Which is the export good of Argentina? ____ wool ____

Draw above the new labor demand curves in the two industries after trade. (Denote them as ___ and ___)

As a result of trade:

Will the nominal wage:

- Increase?  
- Decrease?  
- Ambiguous?  

Calculate it. ____ 48 ____ (Show your work below.)

Will the share of labor in the fishing industry:

- Increase?  
- Decrease?  
- Ambiguous?  

The share of total labor changes from ____ 4/5 ____ to ____ 2/5 ____.  
(Show your work below.)

Will the real wage of the workers in the woolen product industry:

- Increase?  
- Decrease?  
- Ambiguous?  

Why?

- With trade, wages is equalized at a new level. Depending on their relative consumption of wool and of fish, workers may be better or worse off.

Will the real income of the fishing industry capitalists:

- Increase?  
- Decrease?  
- Ambiguous?  

Why?

- Labor moves out of this industry and it decreases the marginal productivity of capital. The real return to capital also decreases. So does the real income of capitalists in the fishing industry.
Problem 2

Let’s use the cloth-beer example developed in class. Labor is the mobile factor, while the two specific factors, capital and land are used in the production of cloth and wheat, respectively. Suppose German government has a new land-use plan to switch a part of farmlands in the east Germany into industrialized districts.

a. Using the four-quadrant graph below, show the effect of an increase in Germany’s supply of capital coupled simultaneously with a reduction in the country’s supply of land.

b. Assume that Germany is a small trading country originally facing the world relative price \( \frac{w_{ld}}{w_{cloth}} \). Show on the graph above the old and the new production mix, as well as the old and the new allocation of labor.

Labor moves from the _____ beer _____ to the _____ cloth _____ industry.

Production of _____ cloth _____ increases and the production of _____ beer _____ decreases.
c. Determine what happens to the real income of the various factors. (Prices are fixed so the changes in wages or VMP are real.)

i. Owners of land: Increase? Decrease? Ambiguous?
   Explain why:
   ➔ The loss of farmland increases the marginal productivity of land, while subsequent labor move-out offsets the positive effect. Depending on what happens to wage, the return to land may go up or down. (Note that if there is only a small or no change in w, the area under the VMPL in beer sector would decrease.)

ii. Owners of capital: Increase? Decrease? Ambiguous?
   Explain why:
   ➔ Although the increase in labor raises the marginal productivity of capital, the increase in capital offsets the effect. Overall effect is ambiguous. (All depends on the movement of wage. Contrary to the land owners’ income, with a small or no change in w, the area under the VMPL in cloth sector w would increase.)

iii. Labor: Increase? Decrease? Ambiguous?
   Explain why:
   ➔ With an increase of factory area (capital), the wage goes up, while a decrease in farmland area (land) would decrease the wage. The overall effect is ambiguous.

Problem 3 – Heckscher-Ohlin

Consider an imaginary country, Orchidia, that is relatively labor abundant. The country produces two goods: electronics (relatively capital intensive) and flowers (relatively labor intensive). Assume that civil unrest in a neighboring country results in a large number of workers immigrating into Orchidia. Show on the two graphs below the effect of this event. Name all the curves.
Specify which good is the export good: flowers.

What happens to the country’s terms of trade?

Improve    Deteriorate    Stay the same

Explain why:
➔ The shock increases the relative supply of flower to electronics, which, in turn, reduces the relative price of flower to electronics. Since this country exports flowers, the terms of trade deteriorates.