

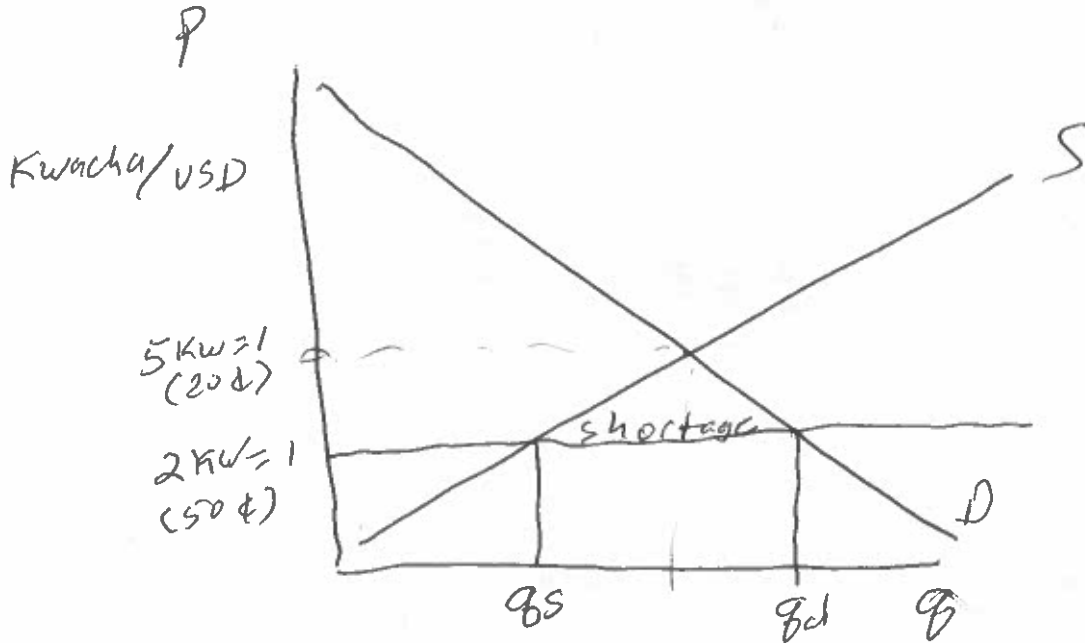
Name: \_\_\_\_\_  
Spring 2022

Economics of Development  
Exam 1

Total quiz is 30 points. Each question is worth three points. Each sub question is worth an equal share of these three points.

1) Exchange rates and trade strategy.

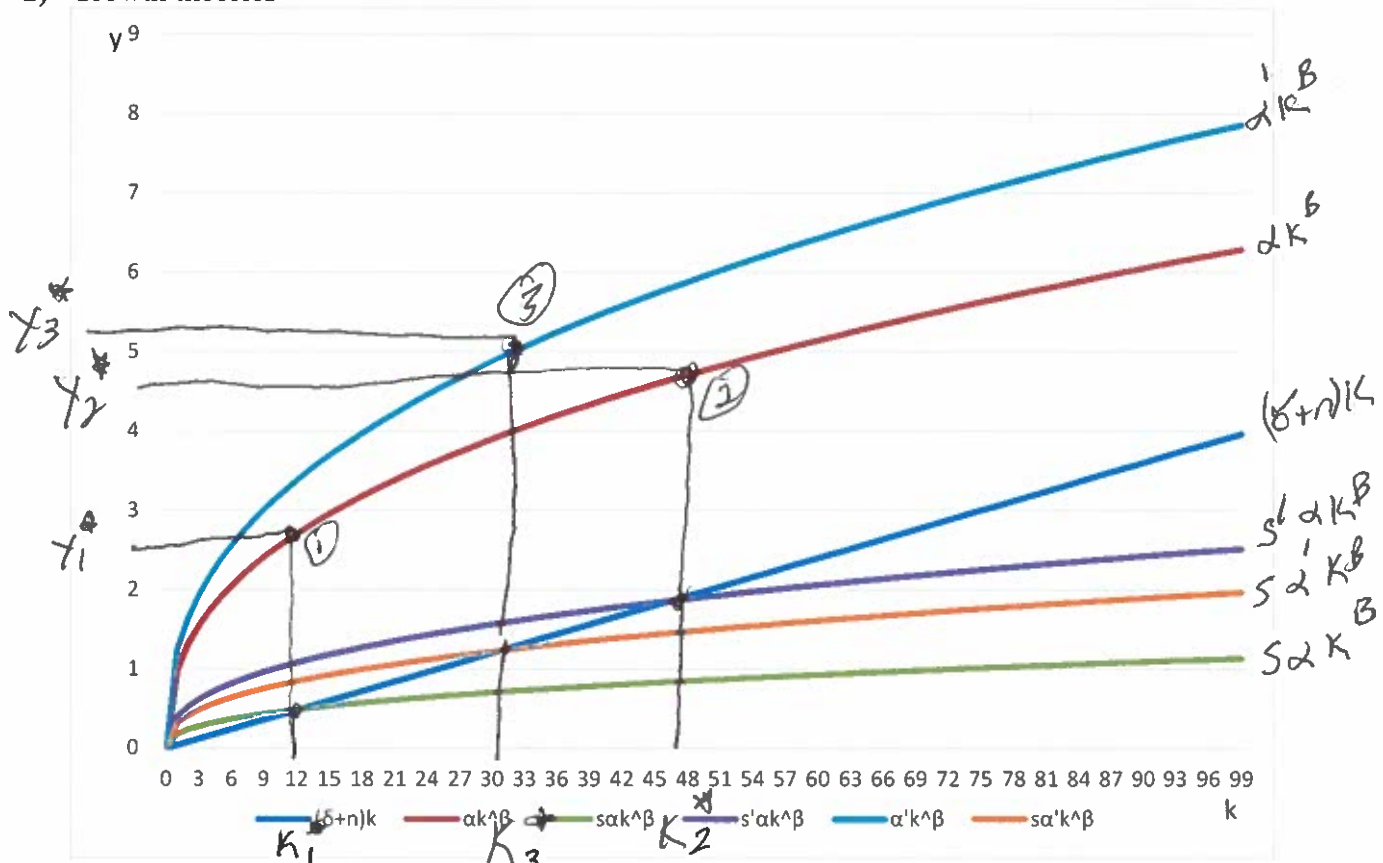
- a. Illustrate on a supply and demand graph the impact of an overvalued domestic currency on the demand for US dollars where the price is units of domestic currency per dollar, and the supply and demand curves are of US dollars.



- b. Explain how an overvalued currency impacts importers and exporters differently.

It makes imported goods and services less expensive and exports of goods and services more expensive.

## 2) Growth theories



a) In the graph,  $k$  is capital per worker on the x-axis, output per worker is defined as  $y = \alpha k^\beta$  on the y-axis with  $\alpha$  capturing total factor productivity and  $\beta$  the share of national income controlled by owners of capital,  $\delta$  is the depreciation rate, and  $s$  is the savings rate. Draw lines and points on this figure to identify steady states in  $k$  and  $y$  for:

1) the baseline  $(\alpha, s)$  as  $(k_1^*, y_1^*)$ ,

2) after growth due to an increased savings rate  $(\alpha, s')$  as  $(k_2^*, y_2^*)$ , and

3) after growth from an increase in total factor productivity  $(\alpha', s)$  as  $(k_3^*, y_3^*)$ .

b) In class, we discussed the Harrod-Domar model and the Solow model created in reaction to Harrod-Domar. Explain how they differ by explaining what each model proposes will lead to positive and potentially constant growth in national income.

Harrod-Domar

$$\frac{\Delta Y}{Y} = \frac{S}{K}$$

where  $Y$  is national income,  $\frac{\Delta Y}{Y}$  is income growth,  $S$  is the marginal propensity to save and  $K$  is the incremental capital-output ratio. A positive  $S$  leads to growth, higher value of  $S$  equal to faster growth.

Solow  $Y = \alpha \cdot K^{\beta} \cdot L^{1-\beta}$   
 $\frac{Y}{L} = \alpha \left(\frac{K}{L}\right)^{\beta} \cdot \left(\frac{L}{L}\right)^{1-\beta}$

$Y = \alpha K^{\beta}$  with  $Y$  as income per capita and  $K$  is machines per worker

$$K_{t+1} = K_t + s \cdot \alpha K_t^{\beta} - \delta K_t$$

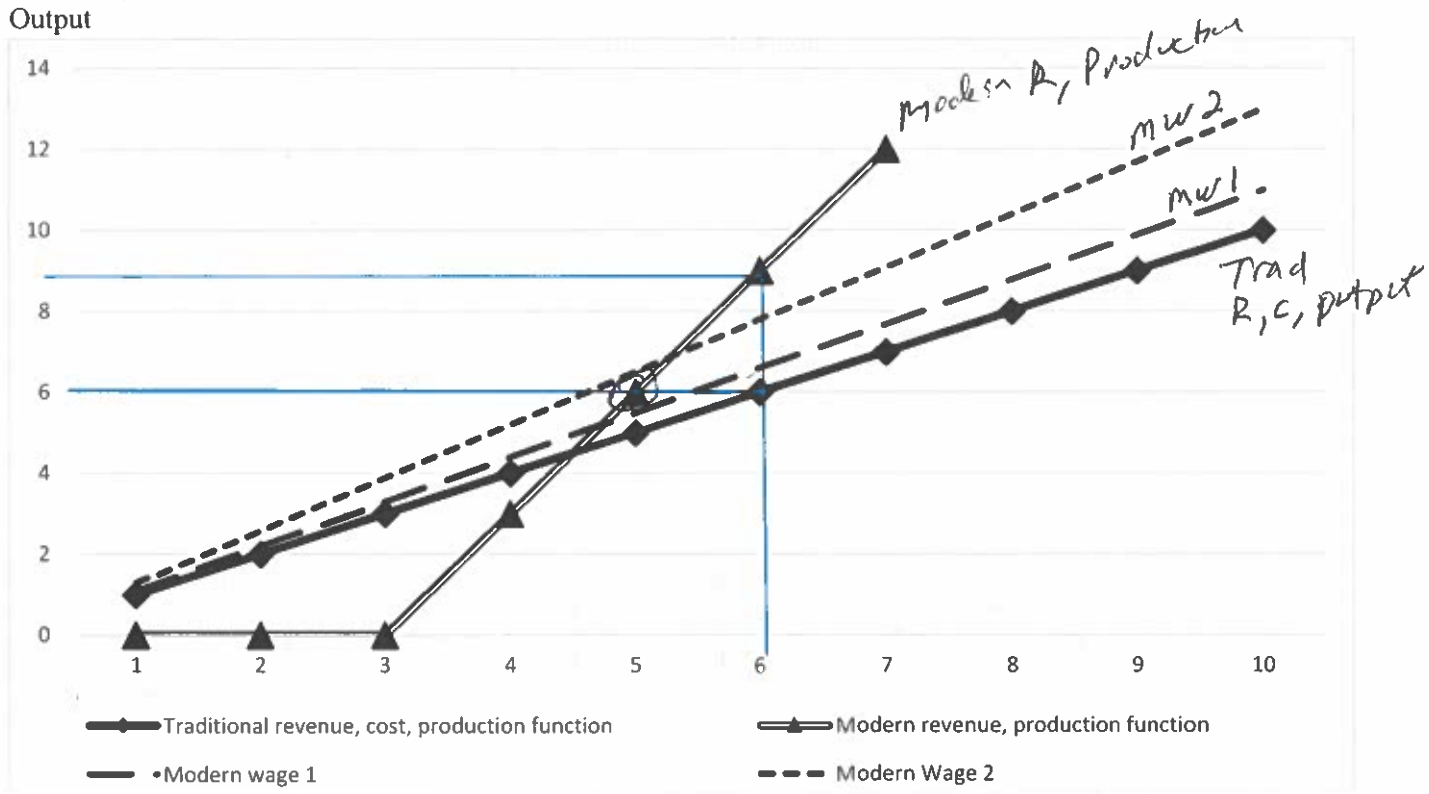
Increasing  $s$  can increase income, but is limited from above by  $\alpha K^{\beta}$  since savings  $s = s \alpha K^{\beta}$  and consumption is  $(1-s) \alpha K^{\beta}$ .

Constant growth in this model is possible if Total Factor Productivity ( $\alpha$ ) grows at a constant rate.

3) Circle to indicate whether the statement is true or false.

Statement	Is the statement True or False?
The Harrod Domar model specifies diminishing marginal returns to capital in the production of output.	True or <u>False</u>
Sen identifies one of the main themes of the first generation of development economics the importance of mobilization of underemployed labor.	<u>True</u> or False
Neutral technological progress leaves unchanged the marginal rate of technical substitution for a given input bundle on an isoquant.	<u>True</u> or False
According to the theory of comparative advantage, every country has to have a comparative advantage in the production of at least one commodity.	<u>True</u> or False
Developing countries are defined as being in the lower and middle-income groups using the World Bank Atlas measure of GNI per capita.	<u>True</u> or False
Romer's model specifies Decreasing Returns to Scale in the input bundle.	True or <u>False</u>
Solow designed his model to explain the cross-country evidence suggesting there is 'conditional convergence' across countries in income per capita over time.	True or <u>False</u>
A dynamic model is needed when choices made today influence the choice set available in the future	<u>True</u> or False

#### 4) More models



The x-axis is labor in one of  $N$  sectors of the economy measured in hundreds. 600 workers are currently employed using traditional technology, and they make 600 units, where output is measured in hundreds as well. Each worker is paid 1 per unit of work and each unit of output produced sells for 1 in the traditional sector. The line with the diamond markers is the traditional revenue, cost, and production function. The double line is the modern revenue and production function. It costs the equivalent of 300 workers to bring in the technology, but each worker is more productive with the modern technology than the traditional technology. Possible cost curves reflecting different wages in the modern sector are represented by the dashed lines.

a. What is the name of this model? *The Big push*

b. Will coordination be needed to have all  $N$  sectors in the economy modernize if the modern wage is represented by modern wage 1? Why or why not?

*No. The economy can absorb 600 units of output, if the modern technology is adopted with the layoff of 100 workers to 500. At that level of production and labor the wage cost is less than the revenue.*

- c. Will coordination be needed to have all N sectors of the economy modernize if the modern wage is represented by modern wage 2? Why or why not?

In contrast, if we reduce workers to 500 and 600 units of output at ~~max.~~ modern wage 2, cost is higher than revenue  
So profit is negative.  
Coordination will be necessary

- d. What is the nature of the spillover benefit to the other N-1 sectors of the economy of the sector represented in the figure modernizing?

Increased wages for workers increase buying power / consumption in the overall economy.

5) Hirschman.

- a. What are forward linkages and backward linkages?

Forward linkage - producers are close to the consumers of their products.

Backward linkage - producers are close to the input suppliers they use in production.

- b. How does the nature of forward and backward linkages support 'industrialization' being preferred to 'agriculture' in models of structural economic change in a developing country?

Subsistence agriculture is a self-contained production and consumption system.

Inputs are then saved/owned by the household, and the household members consume the production.

In contrast, manufacturing uses inputs obtained from input markets (backward linkage) to produce things that will be sold to consumers (forward linkage).

6) There are four workers in the economy who differ in their labor quality as defined by their 'q' value. Q is defined on a scale of [0,1] with higher q being higher quality. Worker one has q=1, worker two has q=0.8, worker three has q=0.6, and worker four is q=0.4. Production takes place using two workers, with output of combining workers i and j defined by  $y_{ij} = q_i * q_j$ . There are three ways we can arrange the workers, A, B, and C.

a) Fill in the following

Arrangement	Pair One	Resulting output 1	Pair Two	Resulting output 2	Total output (1+2)
A	(1, 0.8)	0.80	(0.6, 0.4)	0.24	1.04
B	(1, 0.6)	0.60	(0.8, 0.4)	0.32	0.92
C	(1, 0.4)	0.40	(0.8, 0.6)	0.48	0.88

Say production can be increased by paying for training that will increase the q of a given worker. The cost of this training, c, can be expressed in terms of output y. Training that costs c raises the skills of a worker as represented by a 0.1 increase in their q value. As you may recall from class, training will be given to the lower q worker in a given pair so you can just focus on that.

b) What is the maximum cost c a firm would be willing to pay for the training that will increase the skill level of the 0.8 worker in a (1, 0.8) pairing as measured by output y?

$$y = 1 \cdot 0.8 = 0.8$$

$$y_t = 1 \cdot 0.9 = 0.9$$

$$y_t = 1 \cdot 0.9 - c$$

$$0.9 - 0.8 = c = 0.1$$

c) What is the maximum cost c a firm would be willing to pay for the training that will increase the skill level of the 0.4 worker in a (0.6, 0.4) pairing as measured by output y?

$$y = 0.6 \cdot 0.4 = .24$$

$$y_t = 0.6 \cdot 0.5 = .30$$

$$y_t = 0.6 \cdot 0.5 - c$$

$$.30 - .24 = c = 0.06$$

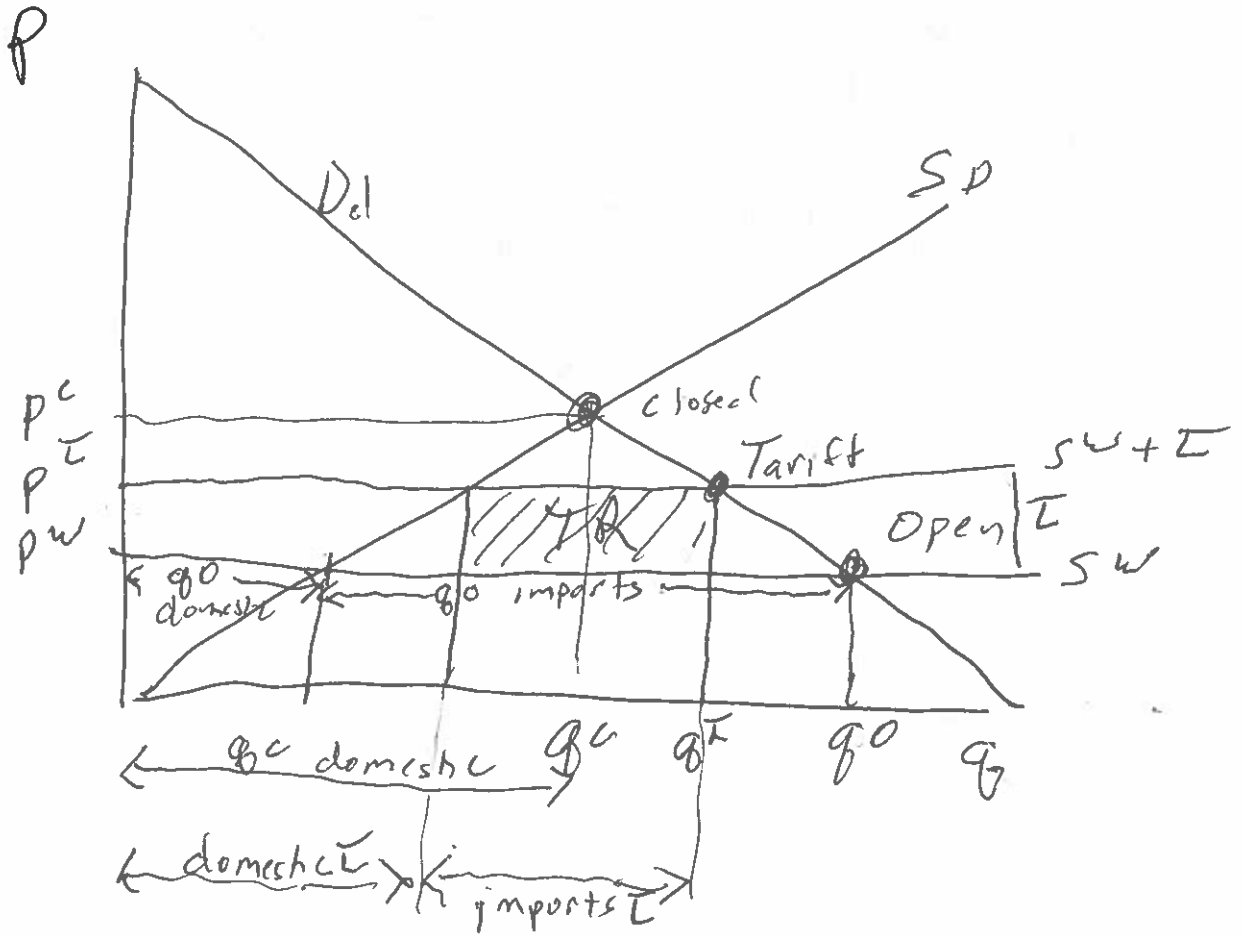
d) Contrast your answers to (b) and (c) to illustrate why the O-ring theory can be used to explain a lack of 'convergence'.

Spending on skill level will go to the already more productive / higher skill workers, leaving the lower productivity skill workers behind.



7) Illustrate the following:

- a. Place a tariff on the imported commodity such that the selling price with the tariff is higher than the international price but less than the domestic price if no imports are allowed. Show the level of domestic supply, the level of international supply, and the tax revenue generated. Contrast the closed economy / autarky outcome, the tariff outcome, and the open market outcome. Y axis is price, x axis is quantity.



8) Bobonia workers produce 30 cases of potato chips and 40 cases of computer chips per unit of labor. Workers in Ouaga can produce 20 cases of potato chips and 30 cases of computer chips per unit of labor.

a. If there are 100 laborers in Bobonia and 100 in Ouaga, describe the level of production of each commodity in each country in autarky if each country divides up their labor force with half of the work force allocated to each commodity.

	Potato Chips	Computer Chips
Bobonia	<del>40</del> 30L, $30 \cdot 50 = 1500$	40L $40 \cdot 50 = 2000$
Ouaga	20L, $20 \cdot 50 = 1000$	30L $30 \cdot 50 = 1500$
TOTAL	2500	3500

b. Identify the product in which each country has a comparative advantage and explain why this is the product in which they have a comparative advantage.

Bobonia: In potato chips,  $\frac{3}{2} = 50\%$  more productive. In computer chips  $\frac{4}{3} = 33\%$  more productive. potato chips are their comparative advantage.

Ouaga:  $\frac{2}{3} = 67\%$  as productive for potato chips,  $\frac{3}{4} = 75\%$  as productive for computer chips. computer chips are comparative advantage.

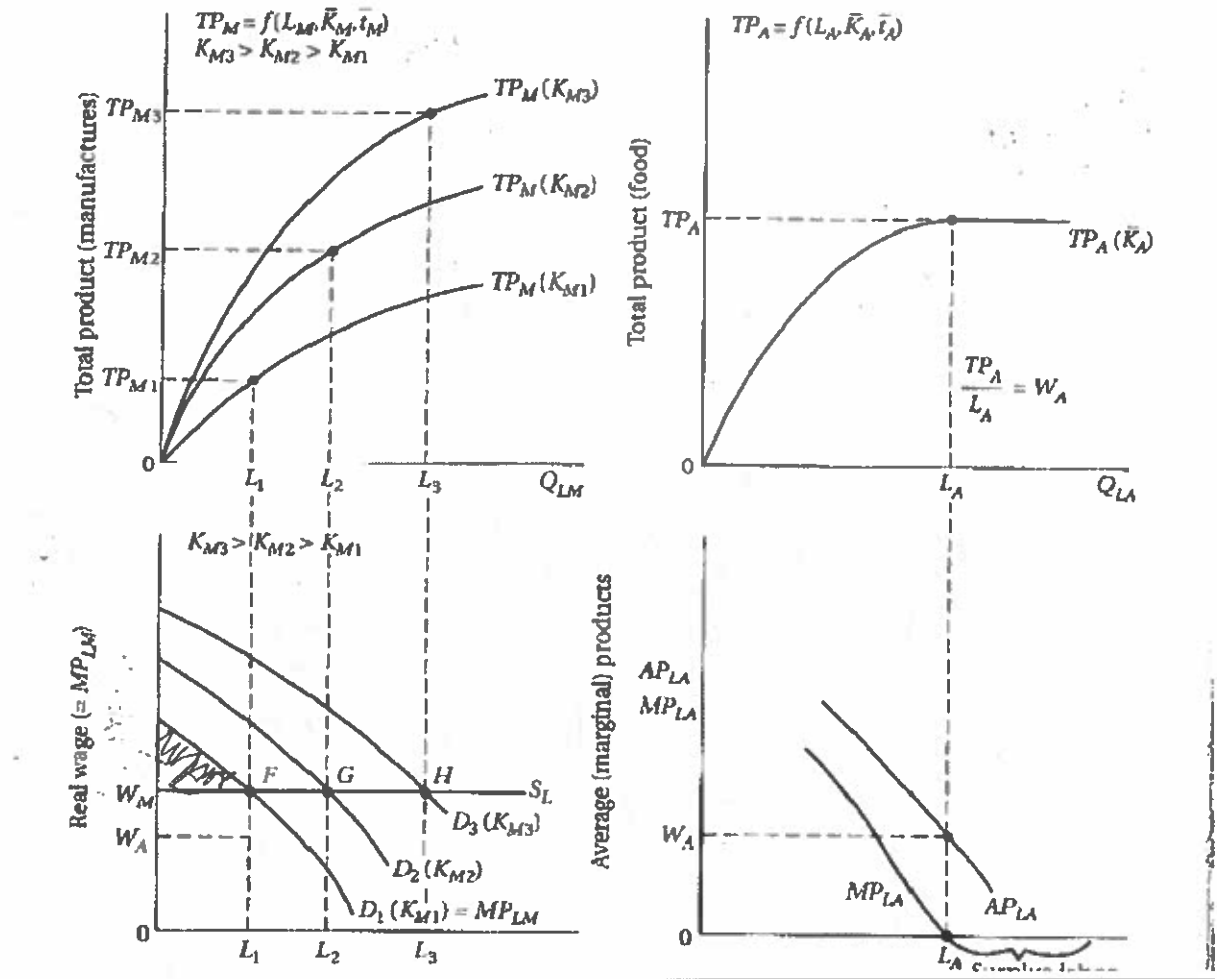
c. Move 5 Bobonia workers to the commodity in which they have comparative advantage and 7 Ouaga workers to the commodity in which they have comparative advantage. What levels of each commodity are now produced in each country?

	Potato Chips	Computer Chips
Bobonia	$30 \cdot 55 = 1650$	$40 \cdot 45 = 1800$
Ouaga	$20 \cdot 43 = 860$	$30 \cdot 57 = 1710$
TOTAL	2510	3510 <del>3500</del>

d. Trade 145 potato chips from the country where potato chips have comparative advantage for 205 computer chips from the country where computer chips have comparative advantage. How much does each country have of each of the goods now?

	Potato Chips	Computer Chips
Bobonia	1505	2005
Ouaga	1005	1505
TOTAL	2510	3510

9) More Models!!!



- What is the name of this model and what does it describe?  
 Lewis model of structural transformation of an economy from agriculture to manufacturing.
- What is the incentive for the workers in the sector represented in the right side of these figures to move to the sector on the left side of these figures?  
 The wage in manufacturing is higher than the wage in agriculture.
- On the left side of this figure, identify where in this model are the funds to increase from  $K_{M1}$  to  $K_{M2}$  generated.  
 The area under the  $VMP_L$  and above the  $W_M$  line is profit that can be invested to increase capital.

## 10) International Issues

- a. Describe the roles of the 1973 and 1979 oil price increases the debt crisis of the 1980s.

- 1) Increased fuel prices worldwide which led to slowed economic growth
- 2) Increased revenue for OPEC members which was put into US/OECD banks
- 3) Banks lent out money to developing countries
- 4) Efforts to control inflation in the US led to high interest rates.

- b. What is an infant industry / import substitution industrialization strategy? country and higher interest rate or variable rate loans

Providing protection to a domestic industry to prevent foreign competition from taking over the domestic market with the goal of having the industry "learn by doing" over time to be able to compete on international markets in the future.

- c. How was "Trade Openness" specified in the Rodrik et al. article Institutions Rule.

$\frac{\text{Import value} + \text{Export value}}{\text{GNP}}$  regressed using a

gravity model to generate Trade openness estimates to use in the second stage regression

Work Page

