

## Second Midterm Exam, Spring 2004

### FACTOR PROPORTIONS MODEL

- 1-4 Cloth production relatively intensively uses labor to land compared to food production. The United States is abundant in land to labor compared to Mexico. The countries have the same relative demand.
1. An increase in labor in the United States causes U.S. production of
    - a) cloth to rise
    - b) food to rise
    - c) cloth to fall
    - d) food to rise and production of cloth to fall
    - e) cloth to rise and production of food to fall
  
  2. An increase in labor in Mexico causes Mexican production of
    - a) cloth to rise
    - b) food to rise
    - c) cloth to fall
    - d) food to rise and production of cloth to fall
    - e) cloth to rise and production of food to fall
  
  3. Under free trade, Mexico exports
    - a) food
    - b) cloth
    - c) food and cloth
    - d) food and sometimes cloth
    - e) cloth and sometimes food
  
  4. Under free trade, the United States exports
    - a) food
    - b) cloth
    - c) food and cloth
    - d) food and sometimes cloth
    - e) cloth and sometimes food

- 5-8 The United States is abundant in land to labor compared to Mexico. The countries have the same technology and the same relative demand. Each country produces both goods.
5. In the United States, opening up to free trade causes the wage paid to workers to
- a) rise
  - b) fall
  - c) stay the same
  - d) rise, if the rent paid to landowners rises
  - e) rise, if the rent paid to landowners falls
6. In the United States, opening up to free trade causes the rent paid to landowners to
- a) rise
  - b) fall
  - c) stay the same
  - d) fall, if the wage paid to workers rises
  - e) fall, if the wage paid to workers falls
7. In the United States, who would object to free trade?
- a) workers
  - b) landowners
  - c) both workers and landowners
  - d) neither workers nor landowners
  - e) depends on spending patterns
8. In Mexico, who would object to free trade?
- a) workers
  - b) landowners
  - c) both workers and landowners
  - d) neither workers nor landowners
  - e) depends on spending patterns

## STANDARD TRADE MODEL

9-12 Free trade prevails between the United States and Mexico and both countries are large. Suppose world relative demand for cloth to food rises.

9. In world markets, the relative price of cloth to food:
  - a) rises
  - b) falls
  - c) stays the same
  - d) rises, if Mexico has comparative advantage in cloth
  - e) falls, if Mexico has comparative advantage in cloth
  
10. The terms of trade for the United States:
  - a) improve
  - b) deteriorate
  - c) stay the same
  - d) improve, if Mexico has comparative advantage in cloth
  - e) deteriorate, if Mexico has comparative advantage in cloth
  
11. The terms of trade for Mexico:
  - a) improve
  - b) deteriorate
  - c) stay the same
  - d) improve, if Mexico has comparative advantage in cloth
  - e) deteriorate, if Mexico has comparative advantage in cloth
  
12. The change in the terms of trade for the United States generates a
  - a) benefit
  - b) burden
  - c) no change
  - d) benefit, if Mexico has comparative advantage in cloth
  - e) burden, if Mexico has comparative advantage in cloth

13-16 Free trade prevails between the United States and Mexico and both countries are large. Suppose world relative supply of cloth to food rises.

13. In world markets, the relative price of cloth to food:
- a) rises
  - b) falls
  - c) stays the same
  - d) rises, if Mexico has comparative advantage in cloth
  - e) falls, if Mexico has comparative advantage in cloth
14. The terms of trade for the United States:
- a) improve
  - b) deteriorate
  - c) stay the same
  - d) improve, if Mexico has comparative advantage in cloth
  - e) deteriorate, if Mexico has comparative advantage in cloth
15. The terms of trade for Mexico:
- a) improve
  - b) deteriorate
  - c) stay the same
  - d) improve, if Mexico has comparative advantage in cloth
  - e) deteriorate, if Mexico has comparative advantage in cloth
16. The change in the terms of trade for the United States generates a
- a) benefit
  - b) burden
  - c) no change
  - d) benefit, if Mexico has comparative advantage in cloth
  - e) burden, if Mexico has comparative advantage in cloth

## FACTOR PROPORTIONS MODEL PROBLEMS

Producing one yard of cloth requires 3 workers and 1 acre of land, while producing one pound of food requires 3 workers and 3 acres of land. Both countries have 198 workers; the United States has 110 acres of land, while Mexico has 132. The price of food is always \$36/pound; the price of cloth is \$24/yard in the United States in autarky and \$28/yard in both countries under free trade.

1. Determine and compare the relative abundance of factors across countries. Determine and compare the relative intensity of factor use across goods. Determine the pattern of comparative advantage and the pattern of trade.
2. Construct the labor constraint (same for both countries). Construct the U.S. land constraint. Determine the U.S. production bundle that fully employs both factors.
3. Construct the Mexican land constraint. Determine the Mexican production bundle that fully employs both factors. Compare the relative production of cloth to food across countries. *Draw graph of factor constraints, with food on the vertical axis. Indicate values for the endpoints and for the quantities produced in each country.*
4. Construct the pricing equation for food (same always for both countries). Construct the U.S. pricing equation for cloth in autarky. Determine U.S. factor prices in autarky that allow both goods to be priced at cost.
5. Construct the pricing equation for cloth under free trade (same for both countries). Determine the factor prices under free trade that allow both goods to be priced at cost. Compare the U.S. relative factor prices (wage relative to rent) under free trade to autarky. *Draw graph of pricing equations here, with rent on the vertical axis. Indicate values for the endpoints and for the factor prices before and after trade.*
6. Calculate and compare the proportional changes in the wage, rent, price of cloth, and price of food. In the United States, owners of which factor would oppose a free trade agreement? How can this group be identified, even in autarky?

## Second Midterm Exam Solutions, Spring 2004

### MULTIPLE CHOICE

- 1e An increase in labor in the United States causes U.S. production of cloth to rise and production of food to fall.
- 2e An increase in labor in Mexico causes Mexican production of cloth to rise and production of food to fall.
- 3b Under free trade, Mexico exports cloth, its comparative advantage good.
- 4a Under free trade, the United States exports food.
  
- 5b In the United States, opening up to free trade causes the wage paid to workers to fall.
- 6a In the United States, opening up to free trade causes the rent paid to landowners to rise.
- 7a U.S. workers would object to free trade (relatively scarce factor).
- 8b Mexican landowners would object to free trade.
  
- 9a In world markets, the relative price for cloth to food rises.
- 10e The terms of trade for the United States deteriorate, if Mexico has comparative advantage in cloth.
- 11d The terms of trade for Mexico improve, if Mexico has comparative advantage in cloth.
- 12e The change in the terms of trade for the United States generates a burden, if Mexico has comparative advantage in cloth.
  
- 13b In world markets, the relative price for cloth to food falls.
- 14d The terms of trade for the United States improve, if Mexico has comparative advantage in cloth.
- 15e The terms of trade for Mexico deteriorate, if Mexico has comparative advantage in cloth.
- 16d The change in the terms of trade for the United States generates a benefit, if Mexico has comparative advantage in cloth.

## PROBLEMS

1. The United States is relatively labor abundant

$$1.8 = \frac{198}{110} = \frac{L}{T} > \frac{L^*}{T^*} = \frac{198}{132} = 1.5$$

Cloth production is relatively labor intensive

$$3 = \frac{3}{1} = \frac{a_{LC}}{a_{TC}} > \frac{a_{LF}}{a_{TF}} = \frac{3}{3} = 1$$

Thus, the United States has comparative advantage in cloth and Mexico in food. The United States will export cloth, while Mexico will export food.

2. The labor constraint is

$$a_{LC} Q_C + a_{LF} Q_F = L, \quad 3Q_C + 3Q_F = 198, \quad Q_F = 66 - Q_C$$

The U.S. land constraint is

$$a_{TC} Q_C + a_{TF} Q_F = T, \quad Q_C + 3Q_F = 110, \quad Q_F = \frac{110}{3} - \frac{1}{3}Q_C$$

The United States's production of cloth and food that fully employs both labor and land is (show math)

$$Q_C = 44, \quad Q_F = 22$$

3. Mexico's land constraint is

$$a_{TC}^* Q_C^* + a_{TF}^* Q_F^* = T^*, \quad Q_C^* + 3Q_F^* = 132, \quad Q_F^* = 44 - \frac{1}{3}Q_C^*$$

Mexico's production of cloth and food that fully employs both labor and land is (show math)

$$Q_C^* = 33, \quad Q_F^* = 33$$

The United States produces more cloth relative to food than Mexico

$$2 = \frac{44}{22} = \frac{Q_C}{Q_F} > \frac{Q_C^*}{Q_F^*} = \frac{33}{33} = 1$$

4. The food pricing equation is

$$a_{LF}w + a_{TF}r = P_F, \quad 3w + 3r = 36, \quad r = 12 - w$$

The U.S. cloth pricing equation under autarky is

$$a_{LC}w^A + a_{TC}r^A = P_C^A, \quad 3w^A + r^A = 24, \quad r^A = 24 - 3w^A$$

The U.S. factor prices that permit both goods to sell at cost under autarky is (show math)

$$w^A = 6, \quad r^A = 6$$

5. The cloth pricing equation under free trade is

$$a_{LC}w + a_{TC}r = P_C, \quad 3w + r = 28, \quad r = 28 - 3w$$

The factor prices that permit both goods to sell at cost under free trade is (show math)

$$w = 8, \quad r = 4$$

The wage relative to the rent rises in the United States in the move from autarky to free trade

$$1 = \frac{6}{6} = \frac{w^A}{r^A} < \frac{w}{r} = \frac{8}{4} = 2$$

6. In the United States, the wage rises by more than the price of either good, while the rent falls relative to the price of either good.

$$\hat{w} = 33\% > \hat{P}_C = 17\% > \hat{P}_F = 0\% > \hat{r} = -33\%$$

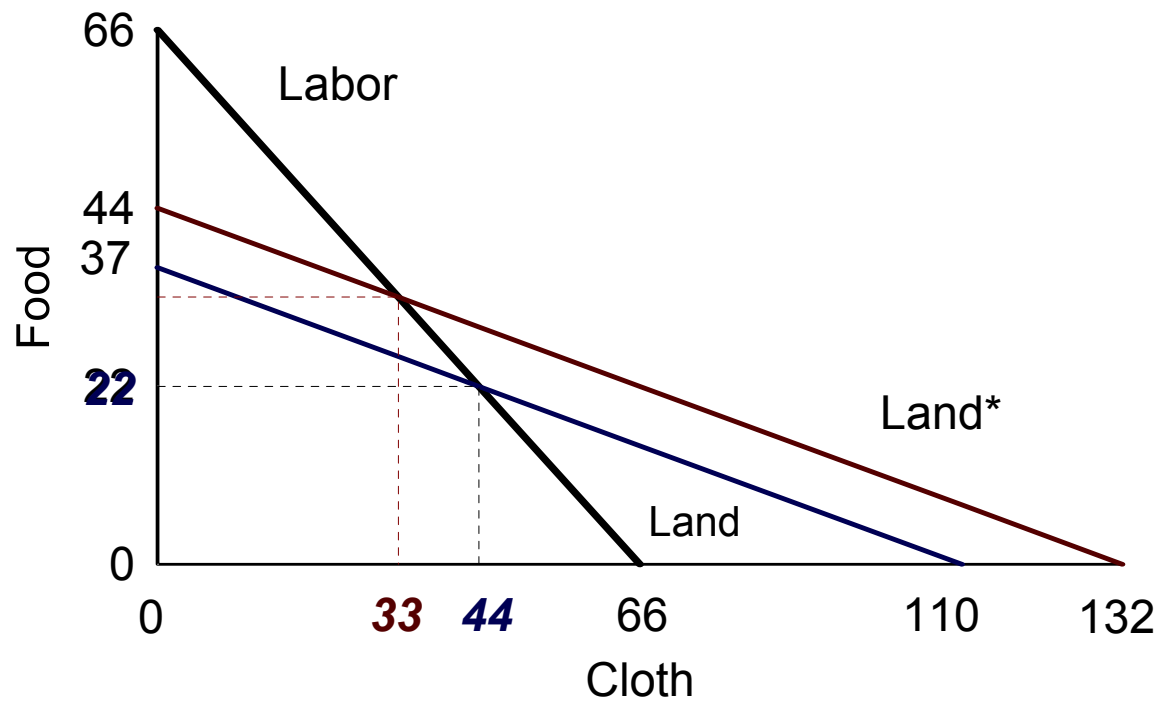
$$\hat{P}_C = \frac{\Delta P_C}{P_C} = \frac{P_C - P_C^A}{P_C^A} = \frac{28 - 24}{24} = \frac{4}{24} = \frac{1}{6} = 17\%$$

$$\hat{w} = \frac{\Delta w}{w} = \frac{w - w^A}{w^A} = \frac{8 - 6}{6} = \frac{2}{6} = \frac{1}{3} = 33\%$$

$$\hat{r} = \frac{\Delta r}{r} = \frac{r - r^A}{r^A} = \frac{4 - 6}{6} = -\frac{2}{6} = -\frac{1}{3} = -33\%$$

Landlords would oppose a free trade agreement because the purchasing power of their income would fall. Landlords own the relatively scarce factor in the United States, determined by comparing factor endowment ratios.

# Production



# Pricing

