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**Solution manual to accompany
Introduction to Economics (Middle East
Edition) by Frank, Bernanke and Squalli
(2010)**

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Solution manual to accompany Introduction to Economics. Middle East Edition

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This manual consists of suggested answers to the Introduction to Economics: Middle East Edition book by Robert H Frank, Ben S Bernanke, and Jay J Squalli.

With special thanks to Georgi Kalchev.

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Chapter 1: Thinking like an Economist

Review Questions

1. By saying that private tennis lessons are better than group lessons he means that during private lessons the teacher pays attention only to you and so you can become a better player. However, applying the cost-benefit principle, even though they provide the benefit of a personal trainer, they also cost more than group lessons so they might not be the best alternative for those who cannot afford it.
2. False, your willingness to drive downtown to save \$30 on a new appliance should depend on whether or not the benefit of buying the appliance from a store downtown, that is the \$30 you save, exceeds the cost of going downtown.
3. This occurs because, when making decisions, people tend to ignore the implicit costs of their decisions. That is, they overlook the benefits of forgone opportunities. In this case the value of watching the \$10 movie carries the implicit cost of not babysitting, from which you would earn \$20.
4. The people who think that frequent-flyer miles make flying free are wrong because they don't consider the cost of a flight they would have to pay for in the future, as a consequence of using up their frequent-flyer miles.
5. In the case of no refund it is indeed the university tuition fee is indeed a sunk cost. When the university offers a refund to the students who drop out during the first two months of the semester we don't have a sunk cost. In both cases the cost is a fixed cost.

Problems

1. The economic surplus you would get from washing your car is \$2.50 ($\$6 - \3.50). That is, the \$6 benefit of having a freshly washed car it minus the \$3.50 cost of washing a car.

2.

Kg of compost	Kg of tomatoes	Marginal cost	Marginal benefit
0	100	0	$\$30(=100*\$0.30)$
1	120	\$0.50	$\$6(=20*\$0.30)$
2	125	\$0.50	$\$1.50(=5*\$0.30)$
3	128	\$0.50	$\$0.90(=3*\$0.30)$
4	130	\$0.50	$\$0.60(=2*\$0.30)$
5	131	\$0.50	$\$0.30(=1*\$0.30)$
6	131.5	\$0.50	$\$0.15(=0.5*\$0.30)$

- To maximize profits you should add 4 kilograms of compost because up until this quantity the marginal benefit of an additional kilogram of compost exceeds the marginal cost. At 5 and 6 kilograms of compost, the marginal cost is greater than the marginal benefit, so at those quantities you are reducing your profit rather than maximizing it.

3. The introduction of the tag system will reduce the quantity of garbage collected in the city. This is so, because now every next can will have an explicit cost of \$2 attached to it, so the

less you give, the more you save, unlike the previous system, where no matter how little or how much you threw away you always had to pay \$6 and the cost of an additional can is \$0.

4. Cola lasts longer at Mustafa's house because his children face an explicit restriction on the amount of cola they can drink – no more than three per week, so each can of cola they drink today costs them a can of cola they could enjoy throughout the week. With Abbas' children this restriction does not hold, so the cola at his house lasts for just a day. What is more, since at Abbas' house there is no restriction on the number of colas you can drink, each child faces the threat that his or her siblings will drink everything, so they try to drink as much as they can before their siblings do so.

5. The interest Ismail will have to pay Mukhtar should equal the profit Mukhtar would have made by investing in \$200 worth of potatoes, which he would have grown, harvested and sold. Since the potatoes double in weight, by planting the potatoes he bought at the end of the year Mukhtar would have gained an extra \$200 worth of potatoes, meaning that he gets a 100% return on his investment and that the interest Ismail should pay him on a \$200 loan is \$200.

6. Despite the fact that in total the first question gave you four times as many points than the second one (48 and 12, respectively), if you could reallocate the time you spent on the two you should devote more time on the second question. This is so, because the extra time you spent on question 1 only gave you 4 points, while the extra time you spent on question 2 gave you 10 points – four points more than you got from spending the same amount of time on the first question.

7. It is stated in the problem that both Nadia and Sarah face the same preferences, incomes and are both rational. This means that they enjoy plays equally, that the \$10 they lost is an equal fraction from their incomes, and that they both see the money lost as a sunk cost. Since both of them can still afford to pay for a ticket after losing \$10 in the form of a ticket and a banknote, respectively, they are both equally likely to see the play anyway.

8. The \$30 you spent on the ticket is a sunk cost, so you should not consider it when deciding whether or not you should go. What you should take under consideration is the additional cost of getting to the game – the opportunity cost of your time and the cost of travelling in a sandstorm, to the benefit of watching the game. The costs for Javed are almost the same as yours. However, since he has not yet bought a ticket the \$25 charged on tickets is added to his cost of attending. This makes Javed's total cost higher than yours. You both have identical tastes, and thus receive the same benefit from watching the game. Since your cost of attending is lower than Javed's, you are the one more likely to attend the game.

9. Mukhar's current cost of a phone call will always exceed 70 cents, with every minute bringing an additional cost of 10 cents. With the new phone service and with his current minimal length of a phone call of 7 minutes, his minimal cost will once again be 70 cents ($2 \times 30 + 5 \times 2$). However, since his cost of an additional minute will now be only 2 cents with the benefit remaining the same under both services, Mukhar is more likely to spend more time talking on the phone once he transfers to the new phone service.

10. If the students are rational, the food consumption at university A will be higher on average. This is so, because the \$500 they pay for their meal plan is a sunk cost, so the marginal cost of an extra meal is zero. With the students at university B, the cost of an additional meal is the \$2 coupon they would otherwise get a refund on, making them more careful with the number of meals they consume. This said, the students at university A will eat until their marginal cost of an extra meal is \$0, while the students at university B will eat until their marginal cost of an extra meal is \$2, meaning that the average food consumption at university A will be higher on average.

Chapter 2: Comparative Advantage

Review Questions

1. Having a comparative advantage at producing a particular good or service means that your opportunity cost of production is lower than another's. Having an absolute advantage means that production takes you fewer hours than it does another.
2. A reduction in the number of hours worked each day, everything else held constant, will reduce the amount of goods and services that can be produced per day, which will shift the economy's production possibilities curve inward.
3. When technological improvements boost labor productivity the production possibilities curve will shift outward. This is so, because an increase in labor productivity means that more goods and services can be produced.
4. Saying that people are poor because they do not specialize makes more sense than saying that people perform their own services because they are poor. This is so, because people specialize in activities where they have a comparative advantage. Doing so leads to higher efficiency, which makes everyone better off. The lack of specialization leads to lower efficiency, which puts people on a lower production possibilities curve. Thus, without specialization people are worse off, i.e. poorer, than they would be with specialization.

Problems

1.

	Waxes per day	Washes per day	Opportunity cost of a wash
Ismail	4	12	1/3 waxes (=4/12)
Kamal	3	6	1/2 waxes (=3/6)

Ismail's opportunity cost of washing a car is completing one third of a wax. Kamal's opportunity cost of washing a car is completing half a wax. Ismail's opportunity cost of washing a car in terms of waxing a car is lower than that of Kamal, which makes Ismail the one with a comparative advantage when it comes to washing cars.

2.

	Waxes per hour	Washes per hour	Opportunity cost of a wash
Ismail	3 (1 in 20 minutes)	1	3 waxes (=3/1)
Kamal	4 (1 in 15 minutes)	2 (1 in 30 minutes)	2 waxes (=4/2)

Ismail’s opportunity cost of washing a car is waxing three cars. Kamal’s opportunity cost of washing a car is waxing two cars. Kamal’s opportunity cost of washing a car in terms of waxing a car is lower than that of Ismail, which makes Kamal the one with a comparative advantage when it comes to washing cars.

	Cider gallons per hour	Cheese ounces per hour	Opportunity cost of a cider gallon	Opportunity cost of a cheese ounce
Hamid	5	2.5	0.5 cheese ounces	2 cider gallons
Karim	3	1.5	0.5 cheese ounces	2 cider gallons

3.

Since both have the same opportunity costs and no comparative advantage exists, they have no incentive to engage in specialization and trade.

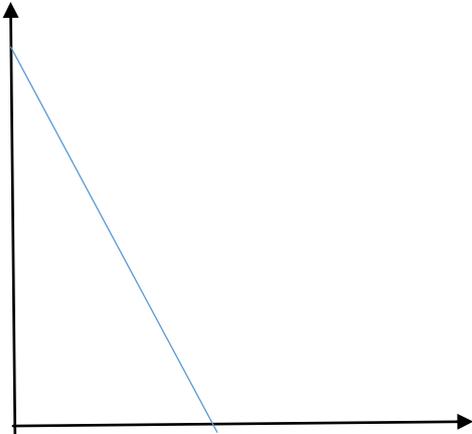
4.

	Clutch per hour	Brakes per hour	Opportunity cost of a clutch	Opportunity cost of brakes
Nancy	1/4 (1 in 4 hours)	1/2 (1 in 2 hours)	2 brakes	1/2 clutches
Salman	1/6 (1 in 6 hours)	1/2 (1 in 2 hours)	3 brakes	1/3 clutches

Nancy has an absolute advantage in replacing clutches since it takes her two hours less to do so than it does Salman.

Nancy’s opportunity cost of replacing clutches is lower than that of Salman, so Nancy has a comparative advantage in replacing clutches. Conversely, Salman has a lower opportunity cost of replacing sets of brakes than that of Nancy, so Salman has a comparative advantage in replacing sets of brakes.

5.



6. a. 28 dresses take seven hours to make, so one hour is left for baking bread – Amina can bake eight loaves of bread.

-> The point of 28 dresses and 16 loaves is unattainable and, by presumption, inefficient.

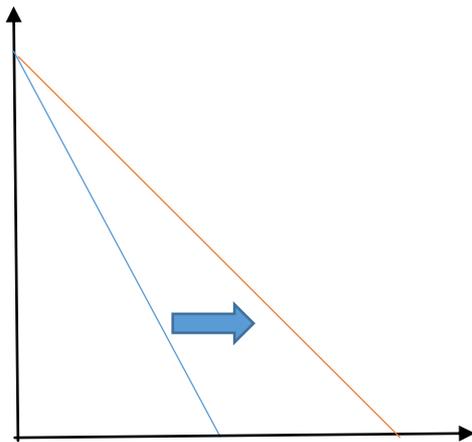
b. 16 dresses take four hours to make, so three hours are left for baking bread – Amina can bake 24 loaves of bread.

-> The point of 16 dresses and 32 loaves is unattainable and, by presumption, inefficient.

c. 18 dresses take 4.5 hours to make, so 3.5 hours are left for baking bread – Amina can bake 28 loaves of bread.

-> The point of 18 dresses and 24 loaves is attainable. However, it is also inefficient, because it lies below Amina's production possibilities curve.

7. Thanks to the sewing machine Amina can now sew a maximum number of 64 dresses per hour.



8. What is meant by the statement is that, as we saw in the previous example, an increase in productivity which directly affects only one good will have a positive effect on the level of production of the other goods in the given market or economy as well. If we use the previous problem as an example, if Amina wanted to sew 24 dresses before the introduction of the sewing machine, she could bake a maximum of 16 loaves of bread. After the introduction of the sewing machine, if she wanted to sew 24 dresses, she would then be able to bake a maximum of 40 loaves of bread. We see that an increase of her dress-sewing capacity also increases the amount of bread she can bake.

9.

Work 6h	Coffee per hour	Nuts per hour	Opportunity cost of a kg of coffee	Opportunity cost of a kg of nuts
Fatima	4 kg	2 kg	1/2 kg of nuts	2 kg of coffee
Kamal	2 kg	4 kg	2 kg of nuts	1/2 kg of coffee

a. Fatima can pick a maximum of 24 kg of coffee per day, while Kamal can pick a maximum of 12 kg of coffee per day. In a day, the two can pick a maximum amount of 36 kg of coffee.

b. Fatima can gather a maximum of 12 kg of nuts per day, while Kamal can gather a maximum of 24 kg of nuts per day. In a day, the two can gather a maximum amount of 36 kg of nuts.

c. Since Kamal has a lower opportunity cost of gathering nuts, and thus he is the one with the comparative advantage of doing so, he would be the one picking nuts. To gather four kg of nuts he would need to work for one hour. This would leave him with five hours for picking coffee, meaning that he would pick ten kg of coffee. Fatima would have six hours for picking coffee, meaning that she would be able to pick a total of 24 kg of coffee. The maximized amount of coffee picked under the constraint of gathering 4 kg of nuts is 34 kg.

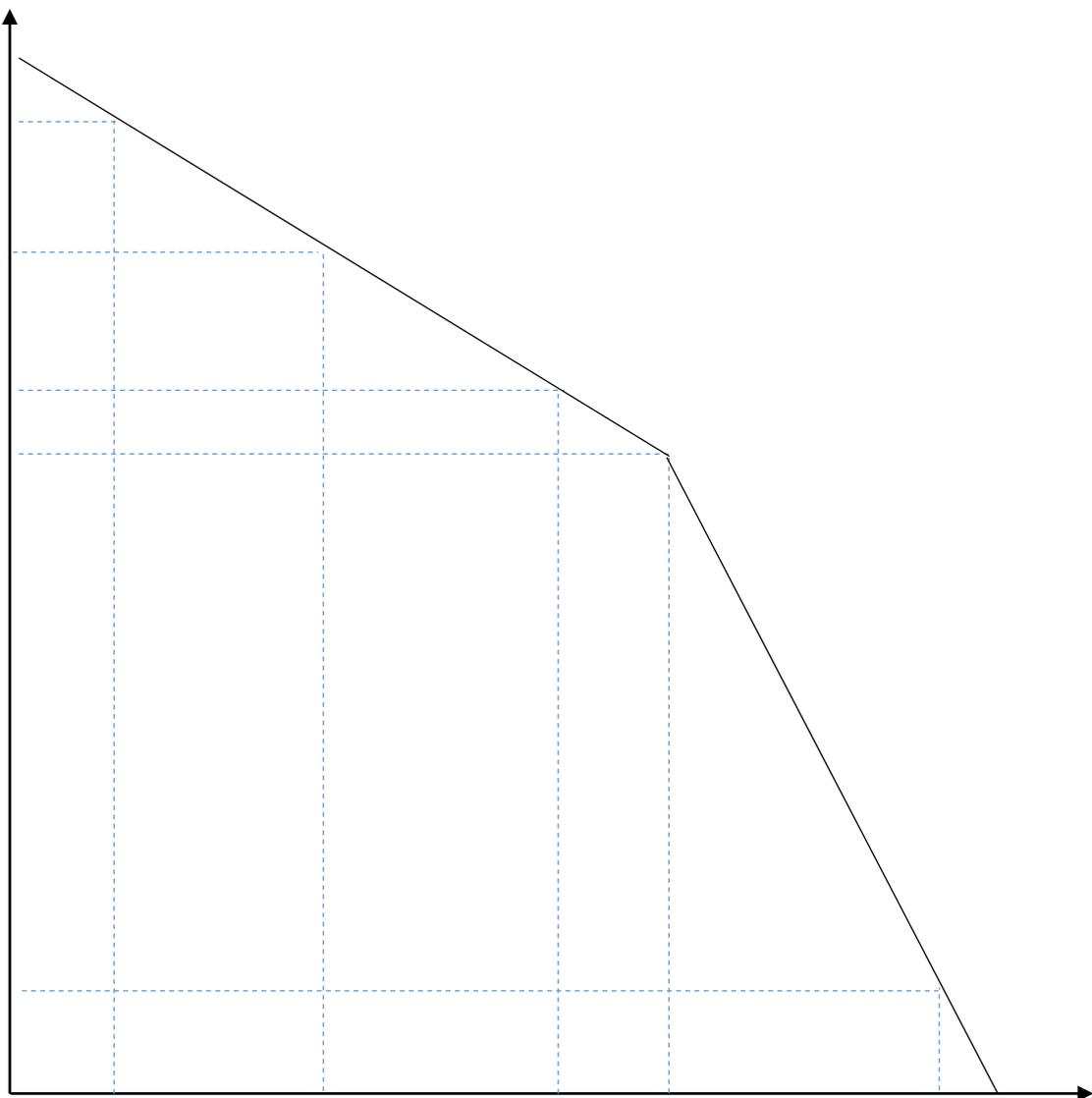
d. Since Fatima has a lower opportunity cost of picking coffee, and thus he is the one with the comparative advantage of doing so, he would be the one picking coffee. To gather eight kg of coffee she would need to work for two hours. This would leave her with four hours for gathering nuts, meaning that he would gather eight kg of nuts. Kamal would have six hours for gathering nuts, meaning that she would be able to gather a total of 24 kg of nuts. The maximized amount of nuts gathered under the constraint of picking 8 kg of coffee is 32 kg.

e. Yes, it is possible for them to gather 26 kg of nuts and 20 kg of coffee. This would happen if we let Karim specialize entirely in gathering nuts, making him gather 24 kg per day. Given this condition Fatima would have to devote an hour to picking nuts, adding 2 kg to the 24 kg gathered by Karim and reaching out 26 kg goal. Fatima would have five hours of work left during which she would pick coffee. At this rate she would pick 20 kg, which is the amount we want to pick.

10. a. It can also be attained by letting Fatima specialize solely in picking coffee, this way producing 24 kg of it each day, and let Kamal split his time evenly between picking coffee and gathering nuts (that is, let him devote three hours to each). This way he will collect 6 kg of coffee and 12 kg of nuts. Adding the 24 kg of coffee Fatima collects each day, we get 30 kg of coffee and 12 kg of nuts. The point (24 kg of coffee, 24 kg of nuts) is also both attainable and efficient. We can get to this point by letting each worker specialize only in what he or she has a comparative advantage.

b. on next page

b. Yes, the graph drawn below is the production possibilities curve (PPC) for the economy consisting of Fatima and Kamal.

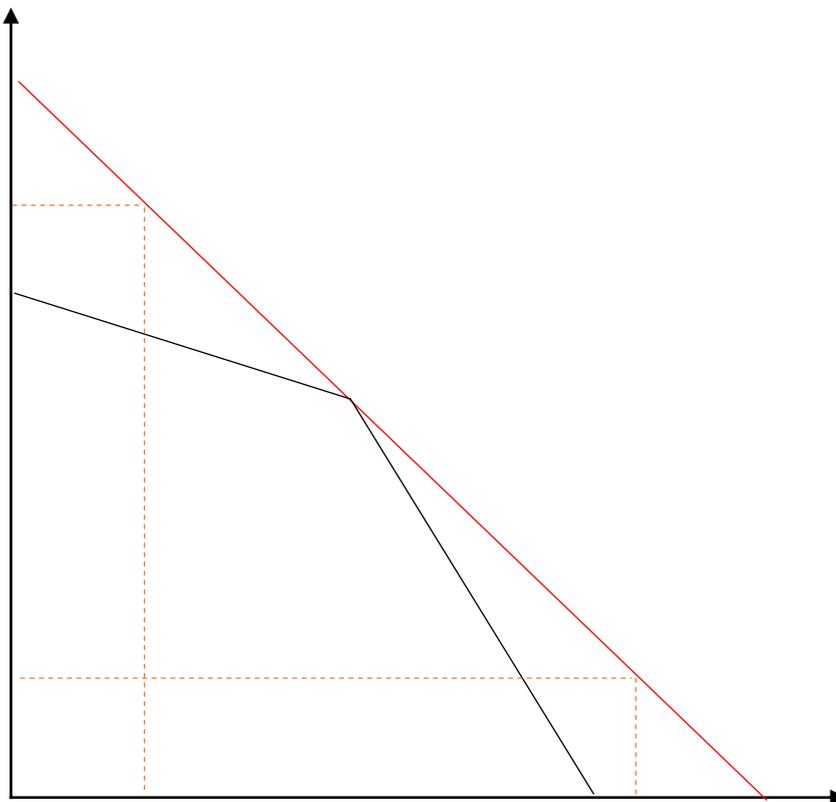


c. If they specialized completely in the good for which they had a comparative advantage, they would produce 24 kg of coffee and 24 kg of nuts, which they would be able to sell for a total of \$96 per day in the world market at the fixed prices of \$2 for a kg of coffee and \$2 for a kg of nuts.

d. Given that they make a total of \$96 from selling their produce, that that a kg of coffee and of nuts cost \$2 each, the maximum amount of coffee they could buy is 48 kg and the maximum amount of nuts they could buy is also 48 kg. Consuming 40 kg of nuts would cost \$80 and 8 kg of coffee would cost \$16 making a total of \$96. Thus, they would be able to consume the above-stated amounts of nuts and coffee.

e. on next page

e. The red line represents the consumption possibilities curve with the world market for Fatima and Karim.



Chapter 3: Supply and Demand

Review questions

1. Knowing the cost of producing a good is not sufficient to predict its market price, because the demand for the good also matters when determining its price.
2. A change in the quantity demanded signifies a movement along the demand curve that is caused by a change in the price of the good. A change in demand is a shift of the whole demand curve which results from a change in a factor other than the price of the good.
3. If the government official's proposition was enacted we would have a situation of excess demand. This is so, because a fixed gasoline price that is below equilibrium will cause the quantity supplied of gasoline to decrease and the quantity demanded to increase. Thus, in order to find out whether or not the proposal was enacted, you will have to check if there is a discrepancy between supply and demand for gas, that is, if there is a situation of excess demand due to the imposed lower prices.

4. The horizontal interpretation of the demand curve sees the curve as a schedule which shows us the quantity of a good consumers are willing to purchase at different prices. The vertical interpretation of the demand curve, on the other hand, tells us what the buyer's reservation price for the good is, given a fixed quantity from the horizontal axis.

Problems

1. a. Tennis courts and squash courts are substitutes, because if the rental price of tennis courts rises relative to that of squash courts, more people will switch to playing squash. It can also be ambiguous due to people's preferences, if some people prefer tennis to squash they might not be willing to switch to squash if the rental price of tennis courts increases.

b. Squash racquets and squash balls are complements, because if a person wants to play squash he will need both a racquet and a ball.

c. The ice cream and chocolate pair can be seen as ambiguous, for the same reason as in part a.

d. Cloth diapers and paper diapers are substitutes, because if the price of cloth prices rises, people might switch to paper ones. Still, if some people regard cloth diapers, their choice might not be affected due to an increase in the price of cloth diapers.

2. a. This technological improvement will allow more to be produced at lower prices so the supply curve will shift rightward.

b. Since fertilizer is an input in the production of corn, a fall in its price will make corn production cheaper and more corn will be supplied, so the supply curve will shift rightward.

c. Since now less will be collected, corn producers will dispose of more funds from their production will make it cheaper, so the supply curve for corn will once again shift rightward.

d. The destruction of corn crops will cause the supply curve to shift leftward, since now corn producers will be able to yield less corn from the land.

3. a. When people's income increases, they become wealthier which means that the demand curve for Sharm El Sheikh vacations will shift to the right.

b. The demand curve for pizza will remain unaffected. Only if the buyers in the pizza market also consume hamburgers will the demand curve for pizza shift to the right following the news about hamburger health hazards.

c. Same as case b, only if the buyers in the market for CDs also buy cassettes will the demand curve for CDs shift to the right.

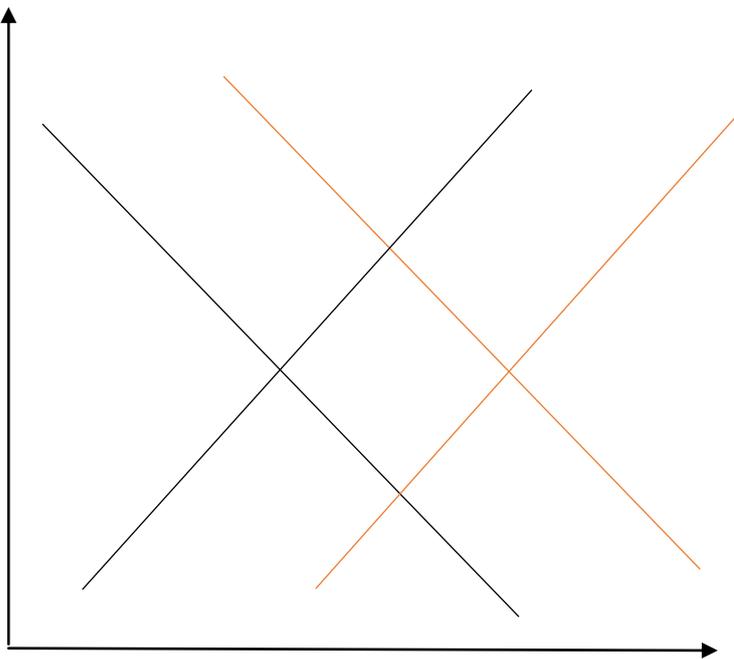
d. If the price of CD's increase the demand curve for CD's will shift to the left because now people will be willing to buy less of them.

- 4.** The supply of binoculars will not be affected by supposed UFO sighting over Dubai. What will change are the demand for binoculars and the quantity supplied of binoculars. Both of them will increase.
- 5.** If the wage of orange pickers rises, the production of oranges will become more expensive, which means that the supply curve for oranges will shift to the left and the supply of oranges will decrease. As a result of this the equilibrium price of oranges will rise.
- 6.** An increase in the birth rate will increase the demand for land and the demand curve for land will shift to the right. This means that the equilibrium price for land will increase.
- 7.** If fish oils are found to be beneficial for our health, the demand for fish will increase and its demand curve will shift to the right. This will raise both the equilibrium price and quantity of fish.
- 8.** Beef and chicken are substitutes. When the price of an input in the production of chicken increases, the price of chicken will increase as well which means that some people will switch to beef. The demand curve for beef will shift to the right, so both its equilibrium price and quantity will increase.
- 9.** The rates charged at hotels near campus during parent's weekend and graduation might differ from the usual rates, because during these two periods the demand for hotel rooms is higher. When the demand curve shifts to the right, the equilibrium price and quantity of hotel rooms will rise.
- 10.** An increase in the required level of insurance will raise the cost of buying a new car, so the demand for new automobiles will decrease and the demand curve will shift to the left. This will lower both equilibrium price and quantity in the market for new automobiles.
- 11.** The mad cow disease outbreak will cause people to veer away from eating beef and switch to chicken. This will increase the demand for chicken and the demand curve will shift to the right. Equilibrium price and quantity will increase. The discovery of a new chicken breed that gains more weight at the same cost as other chickens will increase the supply of chickens and the supply curve will shift to the right. This will lower the equilibrium price and increase the equilibrium quantity. As a consequence of both factors, the equilibrium quantity of chickens will increase. The effect on equilibrium price depends on whether the supply effect is larger (the equilibrium price will fall) or the demand effect is larger (the equilibrium price will rise).
- 12.** If the population increases, the demand for potatoes will increase which will shift the demand curve to the right. As a result, both the equilibrium price and quantity of potatoes will rise. The development of a higher yielding variety will raise the supply of potatoes. Thus, the supply curve will shift to the right. Equilibrium quantity will increase and equilibrium price will fall. As a consequence of both factors, the equilibrium quantity will increase. The overall effect on equilibrium price depends on whether the effect on supply or the effect on demand is larger.

13. If apples are found to prevent colds, the demand for apples will increase and the demand curve will shift to the right. Both equilibrium price and quantity will increase. The fact that 10 percent of apple trees are destroyed will decrease the quantity supplied. The supply curve will shift to the left. As a result, equilibrium quantity will decrease and equilibrium price will increase. . As a consequence of both factors, the equilibrium price will increase. The overall effect on equilibrium quantity depends on whether the effect on supply or the effect on demand is larger.

14. If butter is a complement of corn and the price of butter rises, the demand for corn will fall. The leftward shift in the demand curve will cause both equilibrium price and equilibrium quantity to fall. A decrease in the price of fertilizer will make the production of corn cheaper and as a result the supply of corn will increase. The rightward shift in the supply curve for corn will cause equilibrium price to fall and equilibrium quantity to rise. The overall effect will result in a decrease of equilibrium price. The effect on equilibrium quantity depends on whether the shift in the demand or in the supply curve is larger.

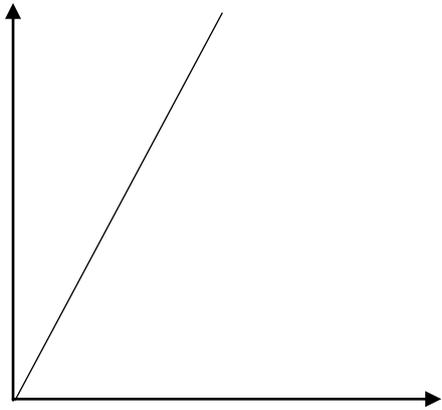
15. In time, both the demand of and supply for tofu have increased. To simplify, we can assume that the magnitude in both changes is equal. From the graph we can predict that equilibrium price will remain the same and equilibrium quantity will increase. (the black lines mark supply and demand today)



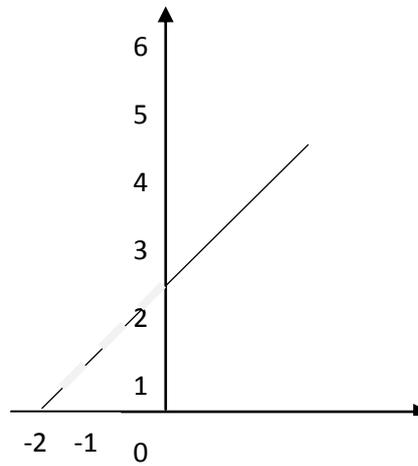
The black lines mark supply and demand today and the red lines show what we predict will happen in 25 years.

16. on next page

16. Supply curve for $P = 2Q_1$

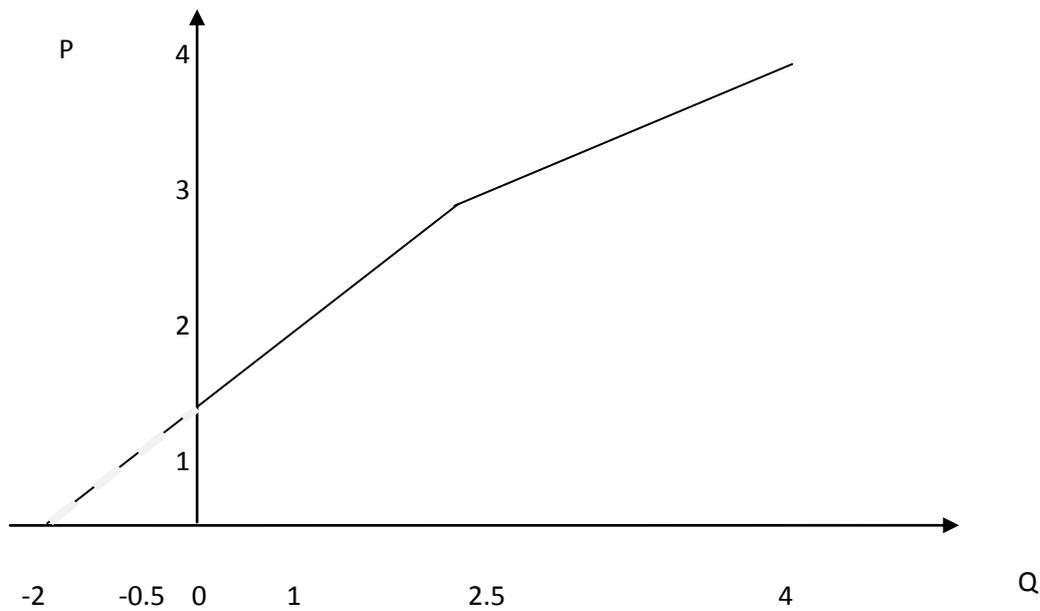


Supply curve for $P = 2 + Q_2$



Market supply curve for the industry

P	0	1	2	3	4
Q_1	0	0.5	1	1.5	2
Q_2	-2	-1	0	1	2
Q_{sum}	-2	-0.5	1	2.5	4



Chapter 4: Elasticity

Review Questions

1. A consumer's price elasticity of demand for a good depends on the fraction of her income spent on that good, because if the good takes up a large share of your budget, the more likely you are to look for a substitute as its price increases.
2. The price elasticity of demand for a good declines as we move down along a straight-line demand curve, because the price to quantity ratio (P/Q) declines as we move down the demand curve. Since the slope of a straight-line demand curve is constant and the formula for price elasticity of demand is $(P/Q)*(1/\text{slope})$, as P/Q declines, price elasticity of demand falls as well.
3. An increase in the price of a product will lead to a reduction in total spending for that product if the demand for that product is elastic, that is, price elasticity of demand for the product is greater than one.
4. When it comes to the elasticity of demand for a good in terms of its own price, economists pay little attention to the algebraic sign, because since price changes move in the opposite direction from changes in quantity demanded the price elasticity of demand will always carry a negative sign. For convenience the sign is dropped and we consider absolute values. The algebraic sign is paid close attention to when it comes to the elasticity of demand for a good with respect to another good's price, because in this case the sign is what determines whether the two goods are substitutes or complements.
5. Supply elasticity is higher in the long run than in the short run, because it takes time for producers to transition to new activities, build new facilities and train new employees.

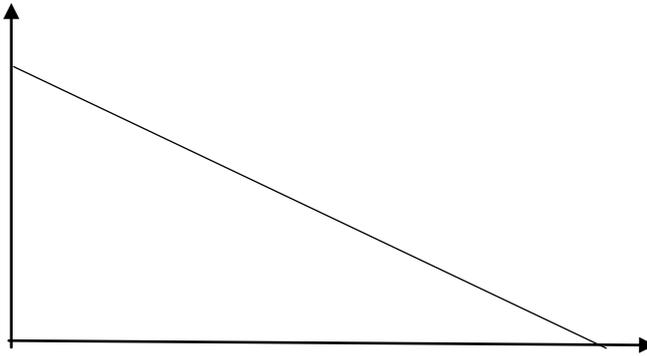
Problems

1. Formula for price elasticity of demand $\epsilon = (P/Q)*(1/\text{slope})$. In this case the slope along the whole line is: $(50 - 75)/(50-25) = -1$ (for simplicity, we can ignore the negative sign here and look at elasticity as an absolute value). Thus, here price elasticity of demand will be $\epsilon = (P/Q)*(1/1) = P/Q$

Price elasticity of demand at:

- Point A = 0
- Point B = $75/25 = 3$
- Point C = $50/50 = 1$
- Point D = $25/75 = 1/3$
- Point E = 0

2. a. Daily demand curve for packs of bagels:



b. $\epsilon = (P/Q) * (1/\text{slope}) = (3/9,000) * [1/(6/18,000)] = (1/3) * [1/(1/3)] = (1/3) * 3 = 1$

c. If the price of bagels increased from \$3 to \$4, total revenues would fall from \$27,000 (\$3*9,000) to \$24,000 (\$4*6,000). Thus the total loss in revenues from the price increase would be \$3,000.

d. $\epsilon = (P/Q) * (1/\text{slope}) = (2/12,000) * [1/(6/18,000)] = (1/6) * [1/(1/3)] = (1/6) * 3 = 1/2 = 0.5$

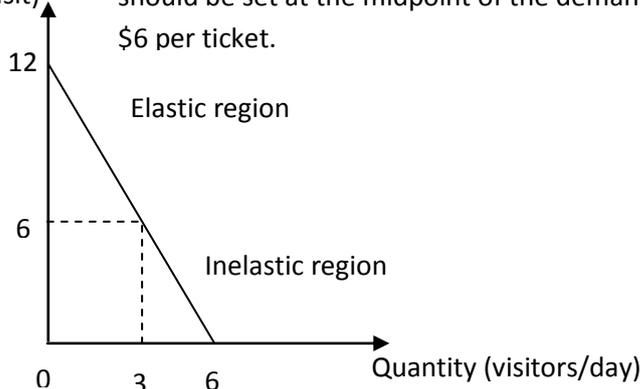
e. If the price of bagels increased from \$3 to \$4, total revenues would rise from \$24,000 (\$2*12,000) to \$27,000 (\$3*9,000). Thus the total increase in revenues from the price increase would be \$3,000.

Note: We disregard the sign of the slope and consider absolute values for simplicity.

3.

Price (\$/visit)

In order for the revenue from selling tickets to be maximized, their price should be set at the midpoint of the demand curve, that is, at the price of \$6 per ticket.



Expanded solution:

Profit will be maximized when total revenue is the highest. Total revenue is equal to total expenditure, which is highest at the price that lies on the midpoint of the demand curve. Thus we need to find the price where elasticity of demand is unit elastic, that is, it is equal to one.

$$1 = (P/Q) * (1/\text{slope}) = (P/Q) * [1/(12/6)] = (P/Q) * (1/2)$$

-> P/Q must equal 2 -> P = \$6 and Q = 3.

- The demand curve is elastic at prices higher than \$6. It is inelastic at prices lower than \$6.

4. The demand for a particular brand of car, like a BMW, is likely to be more elastic than the demand for all cars in general. This is so, because there are many substitutes for BMW's and there are not that many substitutes for cars in general.

5. Since of three groups senior executives are the ones with the highest income, for them a membership of the Association of Business Professionals will take up the smallest income fraction. What is more, changes in the membership fee will have the smallest effect on the budget of senior executives. This means that they are the ones likely to have the least price-elastic demand for membership. Following the same logic, since of the three groups students have the lowest income, if any, they are the ones likely to have the most price-elastic demand for membership.

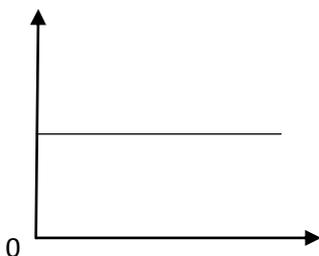
6. Cross-price elasticity of demand = $(\Delta Q_{\text{syrup}}/Q_{\text{syrup}}) / (\Delta P_{\text{milk}}/P_{\text{milk}}) = -4\%/2\% = -2$. Since the cross-price elasticity of chocolate syrup with respect to milk is negative, the two goods as complements.

7. $\epsilon = (P/Q) * (1/\text{slope})$

- At point A: $\epsilon = (4/9) * [1/(2/3)] = (4/9) * (3/2) = 2/3$

- At point B: $\epsilon = (6/12) * [1/(2/3)] = (6/12) * (3/2) = 3/4$

8.



Each slice costs \$1.20 to make, the marginal cost of the next slice of pizza is a constant \$1.20. From the previous chapter we know that each point on a supply curve is the marginal cost. Thus, it follows that supply curve for pizza is a straight horizontal line and the price elastic of supply is perfectly elastic. That is, the price elasticity of pizza is infinite.

9. First, we compute the price elasticity of demand at point A.

$\epsilon = (P/Q) * (1/\text{slope})$ Note: we use the absolute value of the slope for simplicity

$$\epsilon = (4/6) * [1/(6/18)] = (2/3) * [1/(1/3)] = (2/3) * 3 = 2$$

Price elasticity of demand is 2, so a 1% increase in the price of the product at point A will cause the quantity demanded of the product to decrease by 2%.

Total expenditure is equal to price times quantity ($TE = PQ$). So if price increases by 1% and quantity falls by 2%, total expenditure will now be: $TE = 1.01P * 0.98Q = 0.9898 * PQ$. It follows that a 1% rise in price will lead to an approximate reduction of 1% in total expenditure.

10. In this case what the government officials overlooked was that people use electricity not for the sake of using electricity, but in order to achieve other ends, such as having cool air in their homes. When the government makes people buy air conditioners that are more efficient, it reduces the price of buying cooler air, because the more efficient air conditioners provide a better service for the same price as air conditioners of a lower class. If the demand for cool air is elastic compared to its price, people might choose to buy more of it, this way consuming more electricity than before.

Chapter 5: Efficiency and Exchange

Review Questions

- 1.** We use the vertical interpretation of the supply curve when we measure producer surplus, because it tells us the smallest amount a seller would be willing to accept for each quantity of the good. The value we have on the vertical axis for each point on the supply curve represents the marginal seller's reservation price for the good, which is also the marginal cost of producing the good.
- 2.** Economists emphasize on efficiency as an important goal of public policy, because efficiency enables people to achieve their goals to the fullest extent possible. Furthermore, even though an efficient market is not necessarily a just market, it at least does not permit for goods to be reallocated in such a way that some are harmed for the sake of others' benefit.
- 3.** One thing that could be done is to provide in-kind transfers to the retired, offsetting the monetary decrease in surplus. Another thing that could be done is to make sure that \$1 million from the increased employee surplus goes toward the retired.
- 4.** Compensating volunteers to relinquish their seats on overbooked flights is more efficient than a first-come, first-served policy, because the compensation method involves a market for a scarce resource (in this case airplane seats) that in the case of the first-come, first-served method would be allocated by non-market means. The compensation method is guided by what people are willing to receive in order to give up their flight, which is decided by means of an auction. This way the people who value taking the flight the least are the ones who volunteer to skip it and those who really need to take the flight are able to do so. In contrast, the first-come, first-served method, has a higher cost both for those who really need to take the flight but are not able to arrive there early enough and for the airline which ends up with angry and unsatisfied customers.
- 5.** Price ceilings reduce economic surplus, because imposing a maximum price of a good, which is below the good's equilibrium price will cause producers to sell a smaller quantity of

the good. This will reduce producer surplus. Consumer surplus remains unchanged. As a result, total economic surplus, which is the sum of consumer and producer surplus, will fall.

6. The loss in total economic surplus directly experienced by participants in the market for a taxed good overstates the overall loss that the tax causes in economic surplus, because it does not take in account the value of the additional tax revenue collected after imposing the new tax.

Problems

1. a. The weekly consumer surplus is $[(12-10.50)*6]/2 = \$4.50$

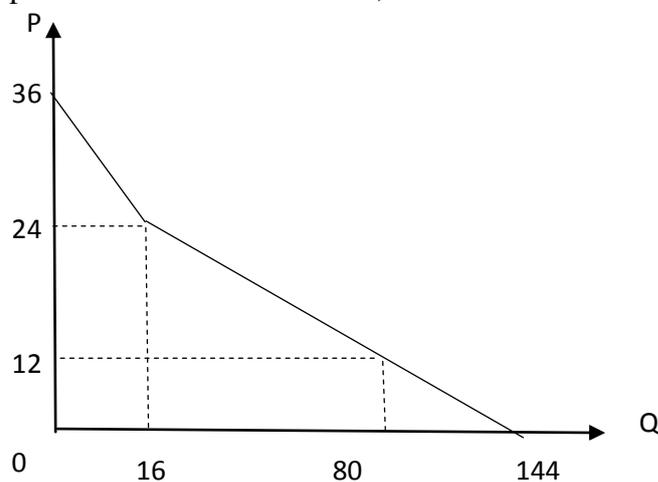
b. The weekly producer surplus is $[(10.50-6)*6]/2 = \$13.5$

c. This is the total economic surplus and it is equal to \$18

2. A company's producer surplus is not the same as its profit. The producer surplus is the seller's revenue minus his reservation price (the reservation price being the marginal cost of production). The seller's profit is equal to his costs minus his revenues. The seller's cost of production, however, is the sum of all marginal costs plus any fixed costs incurred. This means that the producer surplus and profit differ by the fixed costs, which are not reflected in calculating the producer surplus and are included when measuring profits. This means that profit will usually be lower than producer surplus.

3. The total consumer surplus is $[(10-2)*80]/2 = \$32$

4. a. In order to graph the market demand curve, we have to add the two individual demand curves together.



Explanation:

At a market price of \$36, both consumer will buy 0 tickets.

At a price of \$24 the first consumer will buy 0 tickets, but the second consumer will buy 16 tickets [his demand curve is defined by the formula $P=36 - (36/48)*Q$]. Thus the market demand at the price of \$24 will be 16 tickets. At the price of 0 the market demand will be $(96+48=)144$ tickets.

b. If tickets sell for \$12 each, consumer one [with a demand equation of $P=24 - (24/96)*Q$] will demand a quantity of 48 and consumer two whose demand equation is stated in the preceding paragraph will demand 32 tickets, so the market demand for tickets at the price of \$12 will be 80.

The consumer surplus is measured by the area above the price of \$12. We can calculate it by summing the areas of a right triangle and a right trapezoid.

$$\text{Triangle area} = [(36-24)*16]/2 = \$96$$

$$\text{Trapezoid area} = [(16+80)*(24-12)]/2 = \$576$$

$$\text{The total consumer surplus is } \$96 + \$576 = \$672$$

5. The producer surplus is measured by the area of the right triangle bound by the prices of \$3 and \$6. It is equal to $[(6-3)*12]/2 = \$18$

6. a. Since at the price of \$7.50 only two DVDs will be sold and at \$10.50 the number of DVDs sold will be six, the shortage of used DVDs sold at a price of \$7.50 will be four.

b. To find the total economic surplus lost, we can find the economic surplus at the price of \$7.50 and compare it with the economic surplus at the price of \$10.50. The new consumer surplus is again equal to \$13.50. Producer surplus, however has fallen to $[(7.50-6)*2/2]=$ \$1.50. This means that total economic surplus is now \$15. That is, it has fallen by \$3.

7. a. Under these conditions, the first four people will be let in and the consumer surplus will be the sum of their reservation prices since the warden does not charge any cash for the tour. By summing the reservation prices of the first four people to arrive – Handi, Jawad, Khawlah and Jasim, we get \$79 as the total consumer surplus.

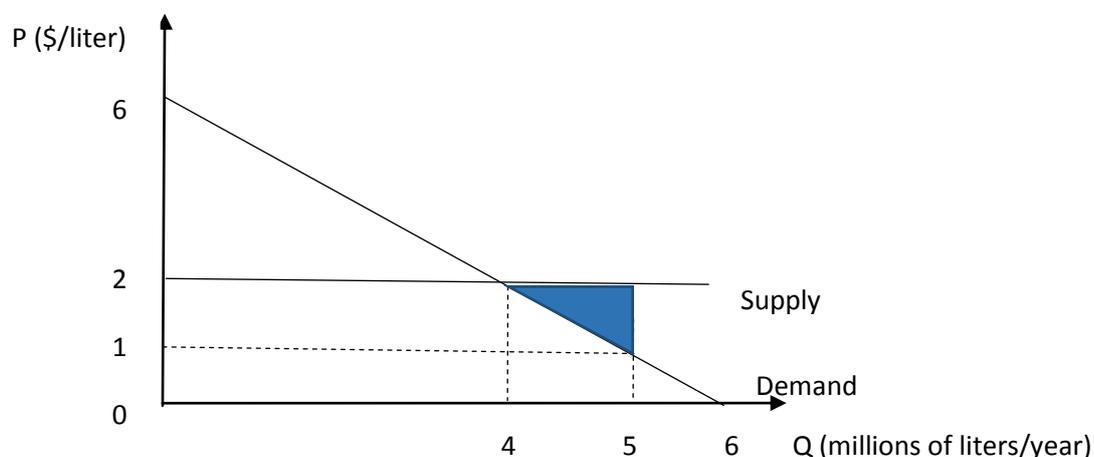
b. If the warden gave all three volunteers the same compensation payment, the amount he has to pay all three must be equal to what the volunteer with the third lowest reservation price is willing to accept. In our case this is Jasim with a reservation price of \$15. So the warden has to pay a total of \$45 to the volunteers. Here the economic surplus will be the sum of the reservation prices of the four who do go on the tour plus the amount by which \$15 exceeds the reservation prices of Jawad and Fayruz minus the \$45 the warden has to pay the three volunteers. By doing the math we get a total of \$66.

c. The compensation policy is more efficient than the first-come, first-served policy, because under it the people who value the tour the most get to go on it.

d. He could use a modified version of the first-come, first-served policy, by giving a spot on the tour to the person with the highest reservation price by charging that person an amount a bit lower than his reservation price and using what he collected as a compensation for the person from the first four to arrive who has the lowest reservation price and to those two who will miss the tour because they arrived late.

8. on next page

8. To better understand the problem, we can draw the supply and demand curves for the heating oil market in Islandia.



The market equilibrium lies at the point (4; 2) where the supply and demand curves intersect. If however, oil is sold for \$1 and not for its equilibrium quantity of \$2, the total amount of oil bought will be five million liters instead of four. Under this price control the economic loss will be equal to the difference between the economic cost of importing oil and the reservation price the people of Islandia have for buying oil. The loss is portrayed by the area of the blue triangle on the graph, which is equal to $[(2-1) \cdot (5-4)]/2 = 1/2 = \0.50 . The economic surplus lost each year because of the government's policy is \$0.50 million, or equivalently, \$500,000.

9. a. The demand curve is shown in Problem 8. The only difference is that in problem 8 the quantity is measured at millions of liters per year, and in this problem where we are looking at separate households the quantity will reflect only liters per year.

b. With the price restriction of \$1 per liter, the yearly consumer surplus will be equal to $[(6-1) \cdot 5]/2 = \$12.50$. Without the price restriction, oil will be sold at \$2 per liter and consumer surplus per year will equal $[(6-2) \cdot 4]/2 = \$8$. It follows that the total consumer surplus lost by each household in the case of no price restriction will be equal to \$4.50.

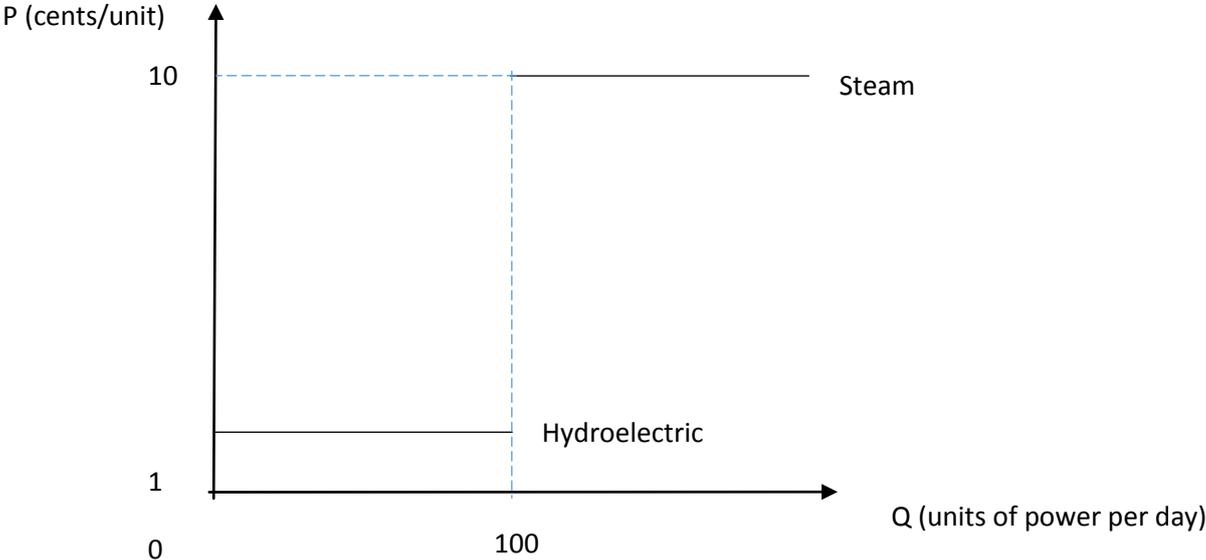
c. The amount with which the government subsidizes each household per year is the \$1 less people have to give for each liter of oil they buy. In this case each household buys five liters of oil per year, so the government subsidy each household gets is \$5 per year. However, this subsidy comes from taxpayer money, so if the government were not to subsidize the purchase of oil, each household would see a \$5 cut in its yearly taxes.

d. if the government abandoned the subsidy and implemented the tax cut, households would gain \$5 from the tax cut itself and would lose \$4.50 in consumer surplus because of the rise of oil prices. This means that the net gain of each household would be \$0.50 per year.

e. In Problem 8 we see that the economic surplus lost each year because of the government's policy is \$500,000 per year. In this problem we see that the total gain for all one million

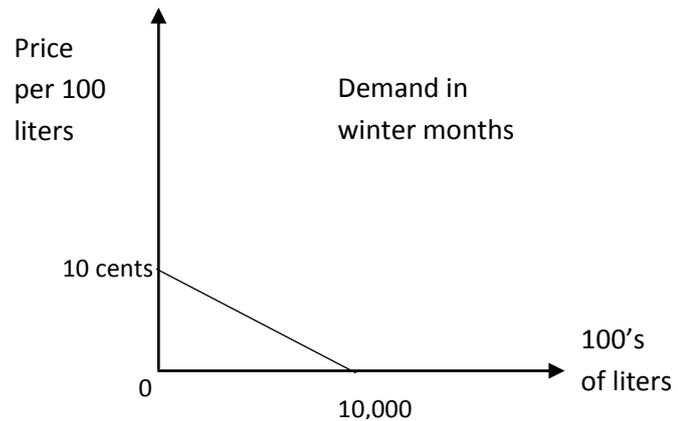
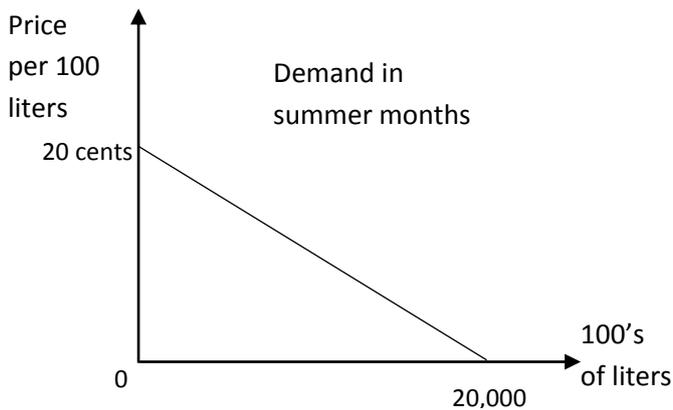
Islandians from the removal of the subsidy is also \$500,000 per year. This tells us that the price restriction of \$1 per liter of oil is not an economically efficient one.

10. a. The marginal cost curve of electric power production in Casablanca is as follows:

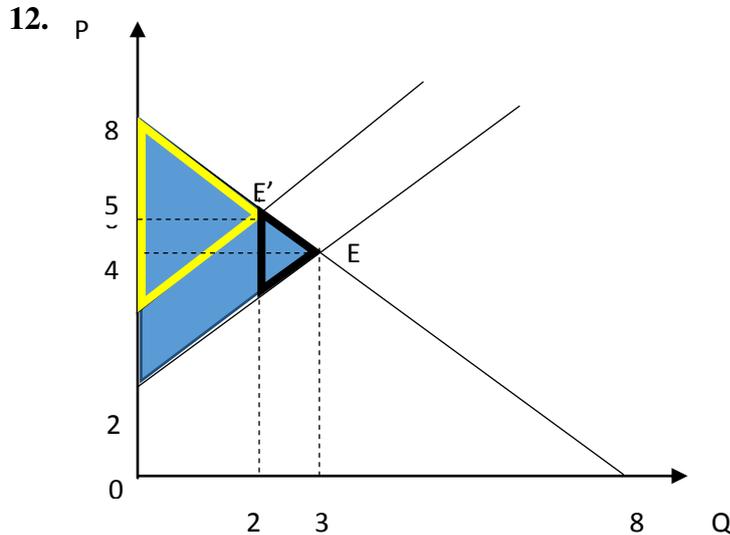


b. The government should aim at maximizing total economic surplus, which occurs at the point where the market price of electric power equals the marginal cost of generating it. The total daily demand for electricity is 200 units, which exceeds by 100 units the amount that can be supplied by the hydroelectric generator. The extra 100 units have to be supplied by the steam generator, whose marginal cost is 10 cents per unit. This means that at 200 units per day, the marginal cost of electric power is 10 cents per unit, no matter where the power comes from. Thus, the amount that citizens should be charged is 10 cents per unit of electric power. To see why this is so, we can compare the marginal benefit of cutting hydroelectric consumption by 100 units. If this was to happen, 100 units of hydroelectric power would be freed up, meaning that the city could divert 100 units of steam power it supplies at a cost of 10 cents to the cheaper hydroelectric power. The cost savings from doing this would amount to 10 cents per day. Charging less than 10 cents per unit would encourage consumers to use power whose marginal benefit is lower than its marginal cost. For example, if the consumers of hydroelectric power are charged 1 cent per unit instead of 10, they will expand their usage until the marginal benefit is exactly equal to the marginal cost. That is, they will expand their usage of power until the benefit they get from the last unit consumed is equal to 1 cent. That last unit could have been used to serve someone using power from the steam generator, for whom the marginal value of a unit is 10 cents, resulting in a 9-cent loss. This would lead to an inefficient use of resources.

11. It might be easier to solve the problem by first drawing the demand curves for the summer and the winter months.



The cost of water from the underground spring is lower than that of water from the lake. This means that the water works should always try to satisfy demand for water by using the underground spring. Since the demand for water is low in the winter months, the municipal water works of Istanbul will be able to satisfy demand by using only the spring. The price it charges should be equal to the marginal cost of water delivery, which in the case of the spring is 2 cents per 100 liters. In the summer, demand for water is higher, so the municipality can satisfy it by extracting water from the lake, which has a higher supply capacity. The price it will charge in the summer months, should be equal to the marginal cost of delivering water from the lake which is 4 cents per 100 liters.



a. The total economic surplus is equal to the area of the big blue triangle. It is as follows:

$$[\$(8-2)*3]/2 = \$9.$$

b. If a \$2 tax is imposed on sellers the supply curve will shift upward by two units and the new equilibrium will be at the point (2; 7) (the new supply equation is $P = 2 + Q + 2 = 4 + Q$). The direct total economic loss we can get by finding the difference between the new total economic surplus and the old total economic surplus. The new total economic surplus is equal to the area of the triangle outlined in yellow: $[(8-4)*2]/2 = \$4$. Thus, the direct loss in total economic surplus is $\$9 - \$4 = \$5$.

c. The revenue the tax will generate each week is \$2 times the two units sold of the good, which amounts to \$4. Thus, the actual loss from the tax is equal to the difference between the

direct economic loss (\$5) and the benefit from the tax (\$4). It is \$1. We can also find this loss, called the deadweight loss, by computing the area of the triangle outlined in black: $[(6-4) \cdot 1] / 2 = \$1$.

Chapter 5 Appendix: Utility Theory and Indifference Curves

Review questions

1. Economists prefer to speak of demands as arising out of “wants” rather than “needs”, because “needs” are the things we all need to survive, like, for example, sufficient food and shelter to keep us going. Once we have our basic needs satisfied we let our wants step in, which in our society are much broader than our needs. Our “wants”, such as let’s say ice cream or vacations, are determined by our personal desires and preferences. We consume our “wants” to the extent to which our budget allows us, that is we allocate our income among the many wants we have. Thus, our wants have a greater impact when it comes to how we spend our money and how we interact in the economy.
2. Even though psychologists cannot measure utility precisely, economists consider the concept useful, because it can be used to rank preferences, which in turn is useful for modelling behavior, for predicting the correlation between certain behaviors and preferences, and thus, for accurately predicting economic theorems.
3. Due to the fact that most goods have diminishing marginal utility, spreading one’s income among different goods is a way to maximize utility. Thus, people are encouraged to consume different types of goods because of diminishing marginal utility.
4. Even though a good might be offered at a monetary price of zero in reality it might not be free, because it can entail an opportunity cost other than money. For example, you might have to wait in line for the good, which costs you time, or you might have to incur other, non-monetary costs to obtain it.
5. For me a good, that has increasing marginal utility with the amount I consumed of it is broccoli, because when I was younger I could not stand them, but with time, the more I had the more I liked it and now I can’t get enough of it.

Problems

1. Since both willingness to pay for food quality and willingness to pay for service quality are increasing functions of income, it is logical to expect that the patrons of the gourmet restaurants have higher incomes than the people who eat at diners, and that the service quality is higher at gourmet restaurants than that at diners.
2. Since it is an all-you-can-eat buffet, the marginal cost of an additional morsel of food is zero. Thus, if you are rational the marginal benefit of the last morsel of food you swallow (its marginal utility) will be equal to marginal cost of that last morsel of food, that is, it will equal zero.
3. Given her current consumption, Maria is receiving 300 utils per dollar from the last dollar she gave for orange juice $[(75 \text{ utils/liter}) \div (\$0.25/\text{liter})]$, and 250 utils per dollar from the last

dollar she spent for coffee $[(50 \text{ utils/liter}) \div (\$0.20/\text{liter})]$. Because the two amounts are not equal, her utility is not being maximized. In order to maximize her utility, Maria should spend more money on orange juice and less money on coffee.

4. Hassan's current marginal utility from the last dollar he gave for peanuts is 10 utils per dollar $[(100 \text{ utils/kg}) \div (\$10/\text{kg})]$ and his marginal utility from the last dollar he gave for cashews is 8 utils per dollar $[(200 \text{ utils/kg}) \div (\$25/\text{kg})]$. Since the two quantities are not equal, Hassan is not maximizing his consumption. In order to do so, he must increase the amount he spends on peanuts and decrease the amount he spends on cashews.

5. She spends \$10 on apples and \$20 on yogurt, so her average utility per dollar for each one is, respectively 2 utils per dollar $(20 \text{ utils/week} \div \$10/\text{week})$ and 2 utils per dollar $(40 \text{ utils/week} \div \$20/\text{week})$. From the information we are given we can conclude that the average utility per dollar Salma gets from consuming organic apples is equal to the average utility per dollar she gets from consuming yogurt. However, since we do not have any information on the marginal utility per dollar she gets from consuming apples and yogurt, we cannot say whether or not she is maximizing her utility, that is, whether or not her current combination of the two goods is the optimal one.

6. a. Here we must take under consideration that even at a price two times higher than the original one, the marginal utility per dollar Amna gets for the 20th round trip might still be higher than the marginal utility per dollar Amna gets from any other good that she consumer, including food. That is, maybe missing a trip will lead to missing a day at work. In this case she is being rational in her decision to not reduce the number of round trips she takes, in spite of the sharp increase in their price.

b. The fact that the price of round trips is not twice as high and Amna still takes the train the same number of times means that she is now poorer. This income effect of the price increase is what might make her reduce the amount she spends on restaurant meals.

7. Tariq's optimal combination of apples and bread given a weekly allowance of \$24 is listed in the table below:

Apples, loaves of bread	\$
0 apples, 8 loaves of bread	24
1 apples, 6 loaves of bread	24
2 apples, 4 loaves of bread	24
3 apples, 2 loaves of bread	24
4 apples, 0 loaves of bread	24

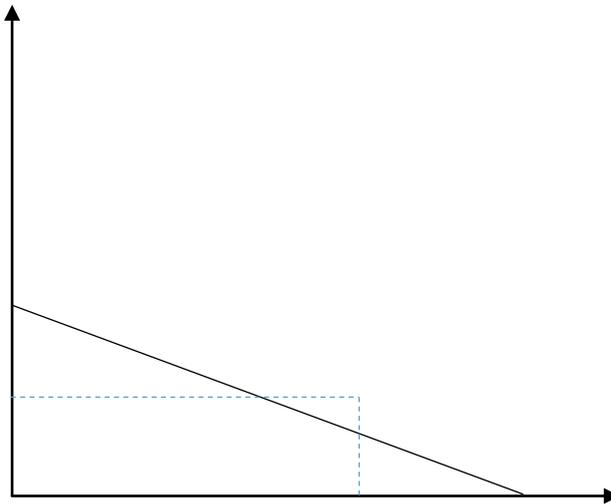
8. In order to answer this question, we have to add one more column to the table we drew above:

Apples, loaves of bread	\$	Total utility:
0 apples, 8 loaves of bread	24	$0 + 57 = 57$
1 apples, 6 loaves of bread	24	$20 + 57 = 77$
2 apples, 4 loaves of bread	24	$38 + 54 = 92$

3 apples, 2 loaves of bread	24	$54 + 46 = 100$
4 apples, 0 loaves of bread	24	$68 + 0 = 68$

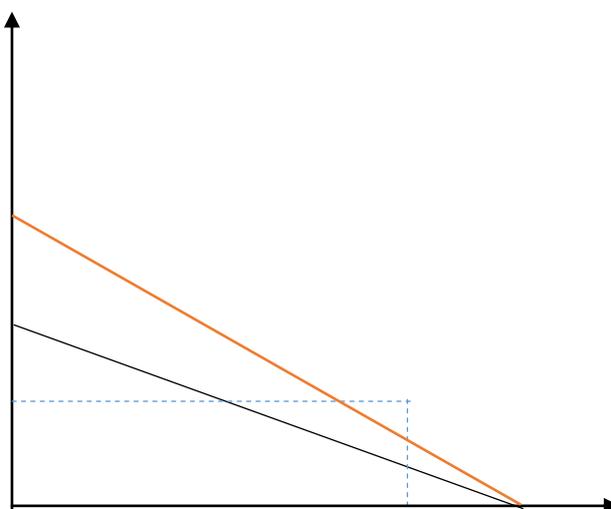
Since the highest marginal utility occurs at the consumption of 3 slices of pizza and 2 loaves of bread, these are the respective amounts of pizza and bread Tariq should consume.

9. The consumer's budget constraint given an income of $M = \$1,200$ is as follows:



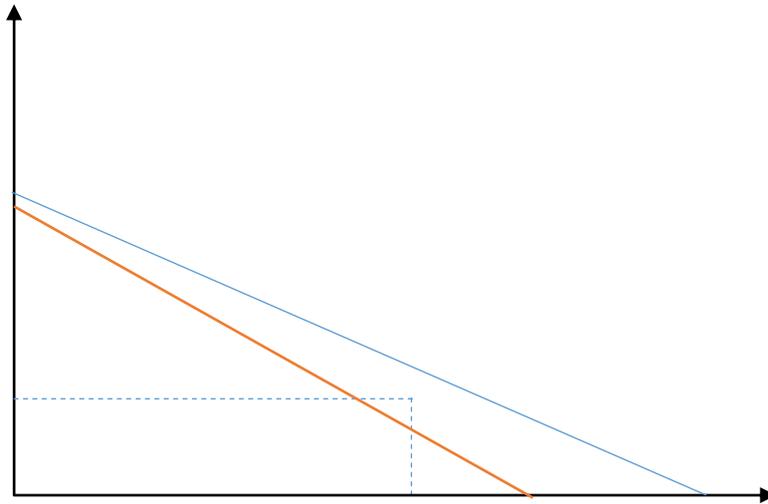
As we can see, the bundle (300 square feet/month, 50 meals/month) lies above the consumer's budget constraint. Thus, it is not affordable. We can also prove this with numbers: the monthly cost of 300 square feet is \$900 ($\3×300) and the cost of 50 meals per month is \$600 ($\12×50), making a total of \$1,500 which exceeds the consumer's income of \$1,200 by \$300.

10. If the price of restaurant meals falls to \$8 the consumer's budget constraint will change as follows:



Once again, the bundle (300 square feet/month, 50 meals/month) lies above the consumer's budget constraint and is not affordable. We can also prove this numerically: the monthly cost of 300 square feet is \$900 ($\3×300) and the cost of 50 meals per month at the new price of \$8 is \$400 ($\$8 \times 50$), making a total of \$1,300 which exceeds the consumer's income of \$1,200 by \$100.

11. If the price of rent falls to \$2 per square foot the consumer's budget constraint will change as follows:



This time the bundle (300 square feet/month, 50 meals/month) lies within the consumer's budget constraint, which makes it an affordable bundle. We can also show this numerically: the monthly cost of 300 square feet at the new price of \$2 per square foot is \$600 ($\$2 \times 300$) and the cost of 50 meals per month at the price of \$8 is \$400 ($\$8 \times 50$), making a total of \$1,000 which is \$200 less than the consumer's income of \$1,200.

12. If the consumer's income rises by 10%, it will now equal \$1,320 ($\$1,200 \times 1.1$) and if the prices of meals and rent rise by 10% they will now equal \$13.20 ($\12×1.1) and \$3.30 ($\3×1.1), respectively. This means that now the maximum amount of meals he can consume per month is 100 ($\$1,320 \div \13.20) and the maximum amount of square feet he can rent is 400 ($\$1,320 \div \3.30), meaning that his budget constraint has remained the same. Thus, the consumer has not been harmed by inflation.

13. Any bundle that lies within the budget constraint is an affordable bundle. Thus, the affordable bundles here are A, C, D, E, G, F. Any bundle that lies beyond the budget constraint is an unaffordable one. Thus, the unaffordable bundles here are J and H. The most preferred bundles are those that lie on the highest indifference curves. If two bundles lie on the same indifferent curve, the consumer is indifferent between the two. Ranging from most preferred to least preferred the bundles are ranked as follows: H; G and J; E and F; C, A and D. The best affordable bundle is G.

14. The best affordable bundle is the one that lies on the budget constraint and at the same time attains the highest possible indifference curve. The only unaffordable bundle is G, because it lies beyond the budget constraint. Bundles F, E, D, C, and A are all affordable. The best affordable bundle is F, because it attains the highest indifference curve of the five affordable bundle. At F, the consumer will spend all his income on Good Y.

Chapter 6: Costs of Production

Review Questions

- 1.** Yes, a business-owner who earns \$10 million per year can credibly claim to earn zero economic profit. This can occur if the sum of his explicit and implicit costs are equal to his \$10-million revenue.
- 2.** What is more likely to be a fixed factor of production for the ice cream maker during the next two months is its factory building and not the workers who operates the machines. This is so, because within the span of two months the ice cream producer might hire or fire workers, but expanding the factory or building a new one will probably take more time than two months.
- 3.** In spite of the unlimited supply of water, labor, seed, fertilizer, sunlight and other inputs, it would be impossible to feed all people on Earth with food grown in a single flowerpot, because even though we have unlimited inputs, the output which the plant or plants in the flower pot can yield is limited. So, it would be impossible for the plant to bear fruit at large enough quantities and at quick enough rates to feed the whole population of the Earth.
- 4.** For a firm which only experiences diminishing returns in the short run: its total product curve will be increasing at a decreasing rate, its marginal product curve decreases first at an increasing and then at a decreasing rate, its marginal cost curve increases at an increasing rate and its total cost curve increases at an increasing rate as well, its total variable cost and its average variable cost increase at an increasing rate too.
- 5.** If at current levels of production a firm's marginal revenue is less than its marginal cost, the firm should decrease the level of its output (or its production costs) down to a level where its marginal revenue is equal to its marginal cost.
- 6.** What could be suggested is to break up the merger. What is likely to happen due to the merger is miss-coordination and inefficient management of joint resources, which would lead to the increase in total average cost.

Problems

- 1. a.** His annual accounting profit is equal to his total revenue minus his total explicit costs, which are equivalent to his annual expenses. Thus, his accounting profit is equal to:
$$\$5,000 - \$(2,000 + 500 + 100 + 150 + 500 + 1,000) = \$5,000 - \$4,250 = \$750.$$
- b.** The two options Jawad faces are running a café and being a recycler. If he chooses to run a café he will forgo the \$1,000 he could be earning as a recycler. He would be willing to pay \$275 per year to run a café, so for him the benefit of running a café is equal to \$275. Thus, his

total opportunity cost of running a café is $\$1,000 - \$275 = \$725$. Economic profit is equal to the accounting profit minus implicit costs (the opportunity cost of not being a recycler). Economic profit is equal to: $\$750 - \$725 = \$25$. Because Jawad's economic profit from running a café is greater than zero, he should go ahead and do it.

c. When recycler's earnings rise to $\$1,100$ per year, Jawad's opportunity cost of running a café will rise to $\$825$ ($\$1,100 - \275) and his economic profit will become $-\$75$ ($\$750 - \825). Since his economic profit from the business is now negative, he should not run a café, and become a recycler.

2. a. To find the profit-maximizing quantity of racquets we can construct the following table.

Number of racquets per day	Number of employee-hours per day	Total revenue (\$ per day)	Total cost of labor (hours times wage)	Total cost of production (labor cost + fixed cost)	Profit (\$ per day) (total revenue – total cost)
0	0	\$0	\$0	\$60	-\$60
5	1	\$50	\$15	\$75	-\$25
10	2	\$100	\$30	\$90	\$10
15	4	\$150	\$60	\$120	\$30
20	7	\$200	\$105	\$165	\$35
25	11	\$250	\$165	\$225	\$25
30	16	\$300	\$240	\$300	\$0
35	22	\$350	\$330	\$390	-\$40

As we see from the table the firm's highest possible profit is \$35, which it earns when it produces 20 racquets.

b. We use the same table, but with a fixed cost of \$30:

Number of racquets per day	Number of employee-hours per day	Total revenue (\$ per day)	Total cost of labor (hours times wage)	Total cost of production (labor cost + fixed cost)	Profit (\$ per day) (total revenue – total cost)
0	0	\$0	\$0	\$30	-\$30
5	1	\$50	\$15	\$45	\$5
10	2	\$100	\$30	\$60	\$40
15	4	\$150	\$60	\$90	\$60
20	7	\$200	\$105	\$135	\$65
25	11	\$250	\$165	\$195	\$55
30	16	\$300	\$240	\$270	\$30
35	22	\$350	\$330	\$360	-\$10

Once again the profit-maximizing quantity is set at 20 racquets. The maximum profit itself, however, is \$65.

3. If a tax of \$10 is imposed on the company the profit at each level of production will fall by \$10, so the profit-maximizing quantity will once again be set at 20 racquets. The maximum profit itself, however will now be \$25. If a \$2 tax is imposed on each racquet, which will increase the cost of production from \$15 to \$17, the marginal cost will increase. We can again use a table.

Number of racquets per day	Number of employee-hours per day	Total revenue (\$ per day)	Total cost of labor (hours times wage)	Total cost of production (labor cost + fixed cost)	Profit (\$ per day) (total revenue – total cost)
0	0	\$0	\$0	\$60	-\$60
5	1	\$50	\$17	\$77	-\$27
10	2	\$100	\$34	\$94	\$6
15	4	\$150	\$68	\$128	\$22
20	7	\$200	\$119	\$179	\$21
25	11	\$250	\$187	\$247	\$3
30	16	\$300	\$272	\$332	-\$32
35	22	\$350	\$374	\$434	-\$84

In the case of a \$2 tax imposed on each racquet produced, the profit-maximizing quantity will be 15 racquets with a profit of \$22. These taxes have such different effects, because the first has an effect on the firm's fixed cost, thus it does not affect its marginal cost, while the second tax has an effect on the firm's variable cost, thus affecting its marginal cost.

4.

Output	TC	TFC	TVC	ATC	AFC	AVC	MC
0	\$200	\$200	\$0	\$0	\$0	\$0	\$0
1	\$240	\$200	\$40	\$240	\$200	\$40	\$40
2	\$270	\$200	\$70	\$135	\$100	\$35	\$30
3	\$305	\$200	\$105	\$101.67	\$66.67	\$35	\$35
4	\$360	\$200	\$160	\$90	\$50	\$40	\$55
5	\$430	\$200	\$230	\$86	\$40	\$46	\$70

5. To answer this question, we need to look at the three firms' average total costs of production.

Output	ATC of Firm 1	ATC of Firm 2	ATC of Firm 3
1	\$100	\$25	\$50
2	\$55	\$30	\$50
3	\$40	\$33.33	\$50
4	\$32.50	\$40	\$50
5	\$28	\$44	\$50
6	\$25	\$46.67	\$50

The average total cost of Firm 1 is decreasing as its output rises, so it experiences economies of scale.

The average total cost of Firm 2 is increasing as its output rises, so it experiences diseconomies of scale.

The average total cost of Firm 3 remains constant as its output rises, so it experiences constant returns to scale.

Chapter 7: Perfect Competition

Review Questions

1. a. False, the economic maxim “There’s no cash on the table” means that unexploited profit opportunities might occur but are quickly eliminated by market participants.
- b. False, firms in competitive environments make no economic profit when the market is in long run equilibrium.
- c. True, however in the long run the innovations will be adapted by other industry players and the economic profit will once again be brought down to zero.
2. This is true as long as the marginal revenue or price exceeds the firm’s average variable cost. If this does not hold, the firm will cease production.
3. Because, economic profit is influenced by competition which pushes the prices toward zero and economic rent often comes about as the result of special talent or asset, which cannot be replicated by market participants, and is thus not influenced by competition.
4. This is so, because since the airlines were regulated by the government and fare productions were prohibited by regulation, what airlines could do in order to compete with each other and create some sort of differentiation was to offer additional services which caused them to incur extra costs. So, given that economic profit is total revenue minus total cost, because of the high costs it was difficult to generate an economic profit even on high fare routes.

Problems

1. In order to maximize profit, the firm should keep producing air conditioners as long as the marginal benefit is at least as great as the marginal cost, that is, at the profit-maximizing level the marginal benefit of \$120 should be greater than or equal to the marginal cost at the given level of production.

Air conditioners per day	Total cost (\$ per day)	Marginal cost
1	\$100	\$100
2	\$150	\$50
3	\$220	\$70
4	\$310	\$90
5	\$405	\$95
6	\$510	\$105
7	\$650	\$140
8	\$800	\$150

In this case there is no quantity for which the marginal cost is equal to \$120. We can use the next best thing, which is the marginal cost of \$105 with a level of production of six air conditioners.

2. The profit maximizing level of output occurs where the price of the good is equal to the marginal revenue of producing it. In this case the profit-maximizing level of output is 570 slices per day. The profit itself is equal to the area of the outlined rectangle in the problem: $$(2.50-1.40)*570 = \$627.$

3. The profit maximizing level of output occurs where the price of the good is equal to the marginal revenue of producing it. In this case the profit-maximizing level of output is 360 slices per day. In this case there is an economic loss instead of a profit, because the average total cost is higher than the price of the good. The economic loss is equal to the area of the rectangle outlined in the problem: $$(0.80-1.03)*360 = -\$82.80.$

4. Here the marginal cost is equal to the price when 260 slices are made per day, so 260 is the profit-maximizing quantity. However, in this the average variable cost is higher than the \$0.50 price of a slice, meaning that the pizza seller should cease production in the short run. This means that he will face no average variable cost. By closing down in the short run he will earn a negative profit equal to his fixed cost. We know that:

Fixed cost = Total cost – Variable cost, where total cost = $ATC*Q$ and variable cost = $AVC*Q$

Here $ATC = \$1.18$, $AVC = \$0.68$ and $Q = 260$. We get:

Fixed cost = $\$1.18*260 - \$0.68*260 = \$306.80 - \$176.80 = \$130.$

By closing down in the short run, the pizza maker will earn a daily negative profit of \$130.

5. Here the marginal cost is equal to the price when 435 slices are made per day, so 435 pizzas per day is the profit-maximizing quantity when the price per slice is \$1.18. (In this case since the price is higher than the average total cost for that quantity the pizza maker will be making a positive profit.) We know that:

Total profit = Total revenue – Total cost, where $TR = P*Q$ and $TC = ATC*Q$

For ATC we can use $TC = FC + VC$. At 435 slices, $AVC = \$0.77$, $VC = AVC*Q$, so it follows that:

$VC = \$0.77*435 = \334.95 . From the previous problem we know that $FC = \$130$. It follows that $TC = \$334.95 + \$130 = \$464.95$.

Total revenue = $P*Q = \$1.18*435 = \513.30 . Thus:

Total profit = $\$513.30 - \$464.95 = \$48.35$.

6. We can assume that the tofu industry is initially in long-run equilibrium where all tofu firms earn an economic profit equal to zero. Because of the innovation the costs of the tofu

factory that implemented it first will fall and in the short run the firm who owns this factory will earn an economic profit because there will not be an immediate change in the tofu market. However, since there is no patent protecting the innovation, other firms in the industry will soon begin to adopt it and will also begin to make an economic profit from it. This economic profit will attract new firms into the tofu-making industry. As a result the supply curve for tofu will shift to the right and the market price for tofu will fall. Prices will keep on falling as more firms continue to enter the market. This will go on until the economic profit falls to zero. At this point the market for tofu will once again be in long-run equilibrium.

7. a. Mawhoob will earn \$600,000 per year. We get this number by adding up the \$100,000 designers with normal ability earn and the extra income he generates for his employer. This extra income is equal to the \$1,000,000 the company makes less the \$500,000 per year the remaining 199 advertising companies in Dubai make. Thus, the extra income Mawhoob brings his employer is \$500,000. Adding up \$100,000 and \$500,000 we get his \$600,000 salary. We can see that $\frac{5}{6}$ of his income is economic rent.

b. The advertising agency which employs Mawhoob won't be able to earn an economic profit, because if it withholds from him some of the extra profit he brings, other advertising companies will be able to offer him a higher salary and still make a profit. This bidding for him will occur until someone is willing to pay him the \$600,000 he deserves for his work, because at this point no economic profit remains to cause bidding among employers.

8. The products of these firms are valuable, because at some point when their products have established their own market niche, the firm stop will give them away and will start selling them at a profit. This future profit is what causes investors to bid in the present for shares of such companies.

9. a. If the market price remains unchanged and no new jobs are created in the short-run tenant farmers will earn \$40,000 more because of the policy amount to a total of \$46,000. This is so, because the farms now yield \$60,000 worth of cotton and their total costs will still be \$14,000, so their profit will equal \$46,000. As time passes factory workers, tempted by the higher profits, will also want to get into the farming business. This will mean that they will start bidding up the rental price of farmland. (Recall that no new jobs were created as a consequence of the policy so this is the only way they can enter farming.) The bidding will go on until the rental price of farmland increases by \$40,000 and becomes \$50,000. At this point farmers will again earn the \$6,000 which factory workers earn and long-run equilibrium will be reached.

b. In the long run the land owner will reap the benefit of the scheme. He will be earning \$50,000 per year for each 120-farm he puts on the market.

10. a. The most Lubna would be willing to spend for experimental costs is \$500,000, given that other spaghetti producers could figure out her recipe in a day. This is so, because she would be able to charge 100,000 customers \$10 per serving (\$5 more than the usual price) for one night only. This means that she will be able to earn \$1,000,000, which is \$500,000 more

than what she usually does. For her to not be at a loss, given that the next evening she won't be able to charge as much, because others would have already figured out the recipe, she would be willing to spend \$500,000 of her \$1,000,000 for experimental purposes.

b. Now that she has a year-long patent she would be able to earn an extra profit of \$500,000 for 365 days. This means that the most she would be willing to spend in experimental costs is $\$500,000 \times 365 = \182.5 million.

Chapter 8: Monopoly, Oligopoly, and Monopolistic Competition

Review Questions

- 1.** The important characteristic all three types of imperfectly competitive firms share is that they have a downward-sloping demand curve unlike firms under perfect competition whose demand is perfectly elastic and takes the form of a horizontal line. The negatively sloped demand curve gives firms under imperfect competition market power, meaning that they are not price takers. Such firms possess market power and can raise the price of their products without losing all their sales.
- 2.** False, all a firm with market power is free to do is choose a price-quantity combination from its demand curve. This does not imply that it can randomly pick whatever price and quantity it wishes.
- 3.** The reason most successful industrial societies offer patents and copyright protection, even though these enable sellers to charge higher prices, is that thanks to the higher prices they can charge because of the protection firms can recover their research and development costs which went into developing the product. That is, most successful industrial societies offer patents and copyright protection is because they encourage innovation.
- 4.** Marginal revenue is the benefit a firm gains from selling an additional unit of its product. It is always less than the market price of the good for a monopolist, because due to the nature of his demand curve, the monopolist can sell an additional unit of a product only if he cuts the price for all units of that product, so the benefit of selling an additional unit is lower than the price for which it is sold. For a perfectly competitive firm marginal revenue always equals the market price the good being sold, because such firms can sell as many units as they wish at the market price. Thus, when a perfectly competitive firm expands output by one unit, its marginal revenue will exactly equal the market price of the product.
- 5.** False, the fact that a natural monopolist charges a price greater than marginal cost does not necessarily mean that he will earn a positive economic profit. That is, a natural monopolist will suffer an economic loss if his optimal, profit-maximizing price exceeds his average total cost.

Problems

1. In order to solve the problem we can construct the following table:

	Saab	Volvo
Annual production	50,000	200,000
Fixed cost	\$1,000,000,000	\$1,000,000,000
Total variable cost (variable cost*quantity)	\$500,000,000	\$2,000,000,000
Total cost	\$1,500,000,000	\$3,000,000,000
Average cost	\$30,000	\$15,000

(Note: here, variable cost and marginal cost are equivalent)

We see that Volvo's average production cost is two times smaller than that of Saab. This is so, because even though both firms face the same total and marginal costs, Volvo's production is four times larger than that of Saab. This means that Volvo currently owns a larger market share than its competitor, which market share is also expected to grow in relative terms because of the firm's significantly lower average cost.

2. a. False. The demand curve for an individual competitive firm is horizontal, while the demand curve for the competitive industry as a whole is downward-sloping (just as it is downward-sloping for a monopoly). Because an individual competitive firm is very small in relation to the market it can sell as many units as it wishes at the market price. For a monopoly, however, changes in the quantity a firm chooses to sell do have an effect on the market price.

b. True. If they choose to charge a price higher than the market price they won't be able to sell anything. If they charge a price lower than the market price, they will not be maximizing profit.

c. True. This is so, because for a natural monopoly as output increases fixed costs are spread over more and more units, which means that average cost per unit (= fixed + variable costs over the number of units) declines as output increases.

3. A single-price, profit-maximizing monopolist: c. Always charges a price above the marginal cost of production. This is so, because a monopolist will set output at the level where his marginal revenue and marginal cost are equal and will choose the price which suits demand at that level of production. What is more, for a monopolist, price is always greater than marginal revenue, which means that it is greater than marginal cost as well. A shortage does not occur, due to the fact that supply and demand coincide. There is no incentive for the monopolist to maximize his marginal revenue, because if he chose to do it he would have to produce zero units of output.

4. If a monopolist could perfectly price-discriminate: a. The marginal revenue curve and the demand curve would coincide. This is so because if a monopolist could perfectly price-discriminate he would sell each unit of output at a price exactly equal to the buyer's reservation price, so the marginal revenue a unit sold generates would be identical to the reservation price. This means that the marginal revenue and the demand curves would coincide. The outcome will be a socially efficient one, because the final unit of output he sells

the monopolist would charge a price equal to his marginal cost of producing that unit. And it is possible that two consumers pay the same price, simply because they might have the same reservation price.

5. In order to price discriminate, a seller must in some way separate his customers into different groups, namely groups of people with different reservation prices. In order to charge the different groups different price for products that are almost the same and have almost the same production costs, a seller must create some sort of hurdle for the group of buyers with a lower reservation price. Such a hurdle might be, for example, a slight difference in the quality of the good or service offered. As an example, we can use the official retailer of a certain luxury brand where products are sold at their ‘original’ price and an outlet of the brand where its products are sold at a lower price, because they might be from an older collection or might have some small defect.

6. The socially desirable price to charge equates the marginal benefit to consumers to the marginal cost of production. However, natural monopolies, have very large fixed costs and low marginal costs, which leads to an average costs larger than the marginal costs for each unit. This means that if a natural monopoly charged a price equal to its marginal cost it would suffer economic losses, because charging a price equal to the marginal cost will fail to cover the average cost of production which entails losses.

7. In order to solve the problem we can construct the following table.

Customer	Reservation price (\$ per photo)	Total revenue (\$ per day)	Marginal revenue (\$ per photo)
			\$50
A	\$50	\$50	
			\$42
B	\$46	\$92	
			\$34
C	\$42	\$126	
			\$26
D	\$38	\$152	
			\$18
E	\$34	\$170	
			\$10
F	\$30	\$180	
			\$2
G	\$26	\$182	
			-\$6
H	\$22	\$176	

(To fill in the total revenue column we just multiple the corresponding reservation price by the number of potential buyers whose reservation price is at least that high.)

a. If Adam’s cost per portrait is \$12 and must charge all customers the same price, he should charge each customer \$34, because up to customer E whose reservation price is \$34 the marginal revenue exceeds the marginal cost. In this case \$18 and \$12, respectively. At

customer F the marginal cost of \$12 is higher than the marginal revenue of \$10. The same goes for customers G and H. This means that Adam will make portraits for customers A to E, serving a total of five people, which he will charge \$34 each. His profit will be equal to $(34 - 12) * 5 = \$22 * 5 = \110 .

b. The consumer surplus is equal to the sum of the reservation prices of all customers served minus the price they pay for a portrait and is: $(50 + 46 + 42 + 38 + 34) - \$34 * 5 = \$210 - \$170 = \$40$.

c. The socially efficient number of portraits is eight, because all buyers have a reservation price higher than Adam's \$12 marginal cost.

d. Under these circumstances, Adam is able to perfectly price discriminate. This means that he can charge each customer exactly his or her reservation price. In this case he will serve all eight customers, since even the lowest reservation price of customer E is higher than Adam's marginal cost of \$12. In this case his profit will be $(50 + 46 + 42 + 38 + 34 + 30 + 26 + 22) - \$12 * 8 = \$288 - \$96 = \$192$.

e. In this case the consumer surplus is \$0, because each buyer is charged exactly his or her reservation price.

f. In this case Adam is faced with two groups of customers, A to E and F to H. The first group, whose reservation price exceeds \$30 won't bother to use a coupon, while the second group, whose reservation price is below \$30 will use a coupon. We can use the following two tables for the two sub-markets:

Customer	Reservation price (\$ per photo)	Total revenue (\$ per day)	Marginal revenue (\$ per photo)
			\$50
A	\$50	\$50	
			\$42
B	\$46	\$92	
			\$34
C	\$42	\$126	
			\$26
D	\$38	\$152	
			\$18
E	\$34	\$170	

In this sub-market he will serve all five customers at the price of \$34.

Now, we make a table for the discount sub-market:

Customer	Reservation price (\$ per photo)	Total revenue (\$ per day)	Marginal revenue (\$ per photo)
			\$30
F	\$30	\$30	
			\$22
G	\$26	\$52	

			\$14
H	\$22	\$66	

He should set the discount price at \$22 and should sell all three portraits in the market.

g. His economic profit in this case will be $\$34*5 + \$22*3 - \$12*8 = \$170 + \$66 - \$96 = \$140$.

The consumer surplus is equal to: $\$(50+46+42+38+34) - \$34*5 + \$(30+26+22) - \$22*3 = \$210 - \$170 + \$78 - \$66 = \$52$.

8. The total surplus lost is equal to $[(\$40-20)*(12-8)]/2 = \40 . Of this sum, \$20 accounts for lost consumer surplus (= area of small triangle between \$30 and \$40 and 8 and 12 ounces of perfume).

9. If Samira could perfectly price-discriminate, total surplus would be $(\$60*12)/2 = \360 . However, this amount will account for producer surplus only. Consumer surplus here will be zero, since Samira will be able to charge each customer exactly his or her reservation price.

10. In order to solve the problem, we can construct the following table:

Price	\$1.00	\$0.90	\$0.80	\$0.70	\$0.60	\$0.50	\$0.40	\$0.30	\$0.20	\$0.10
Quantity sold	1	2	3	4	5	6	7	8	9	10
Total revenue	\$1.00	\$1.80	\$2.40	\$2.80	\$3.00	\$3.00	\$2.80	\$2.40	\$1.80	\$1.00
Marginal revenue	\$1	\$0.80	\$0.60	\$0.40	\$0.20	\$0	-	-	-	-
							\$0.20	\$0.40	\$0.60	\$0.80

a. See the table.

b. Profit is maximized at the price where marginal revenue (MR) and marginal cost (MC) are equal. Here we are told that the each cup of lemonade costs \$0.20 to make. That is the marginal cost of producing a cup of lemonade of \$0.20. From the table we see that marginal revenue is equal to \$0.20 at a price of \$0.60. That is, Badriya's profit-maximizing price is \$0.60.

c. At the price of \$0.60 Badriya's economic profit is equal to $5*(0.60-0.20) = 5*\$0.40 = \2.00 . Her consumer surplus is $(\$1.00-\$0.60) + (\$0.90-\$0.60) + (\$0.80-\$0.60) + (\$0.70-\$0.60) = \$0.40 + \$0.30 + \$0.20 + \$0.10 = \$1.00$.

d. If Badriya wants to maximize total economic surplus, she would charge a price equal to her marginal cost. Given that her marginal cost is \$0.20, the price she would choose is also \$0.20. This way total economic surplus would be equal to $(\$1.00-\$0.20) + (\$0.90-\$0.20) + (\$0.80-\$0.20) + (\$0.70-\$0.20) + (\$0.60-\$0.20) + (\$0.50-\$0.20) + (\$0.40-\$0.20) + (\$0.30-\$0.20) = \$3.60$.

e. Given these conditions if Badriya wanted to maximize profit she would charge each person his or her respected reservation price. That his, her profit would now be $(\$1.00-\$0.20) + (\$0.90-\$0.20) + (\$0.80-\$0.20) + (\$0.70-\$0.20) + (\$0.60-\$0.20) + (\$0.50-\$0.20) + (\$0.40-\$0.20) + (\$0.30-\$0.20) = \$3.60$ – the same as the total surplus calculated in part d.

Chapter 8 Appendix: The Algebra of Monopoly Profit Maximization

Problems

1. a. The equation for the marginal revenue has the same intercept as the demand curve equation and a slope twice as large. So, for the three markets what we get as marginal revenue is:

$$\text{Saturday night, adult: } P = 12 - 4Q$$

$$\text{Sunday afternoon, children's: } P = 8 - 6Q$$

$$\text{Sunday afternoon, adult: } P = 10 - 8Q$$

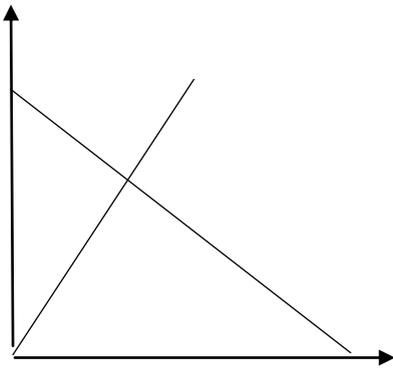
b. Profit is maximized at the point where marginal cost is equal to marginal revenue. We find the quantity for this equilibrium and then we plug it into the demand equation in order to get the profit-maximizing price. Here, we have that marginal cost is \$2 in all cases, so the profit maximizing price for each of the three markets is:

$$\text{Saturday night, adult: } 12 - 4Q = 2, -4Q = -10, Q = 2.5, P = 12 - 2*(2.5), P = \$7$$

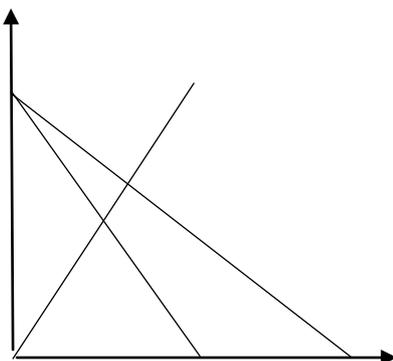
$$\text{Sunday afternoon, children's: } 8 - 6Q = 2, -6Q = -6, Q = 1, P = 8 - 3*(1), P = \$5$$

$$\text{Sunday afternoon, adult: } 10 - 8Q = 2, -8Q = -8, Q = 1, P = 10 - 4*(1), P = \$6$$

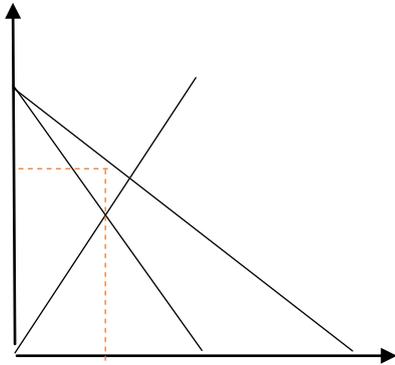
2. a.



b. The marginal revenue curve has the same intercept as the demand curve and an intercept which is twice as large. Thus, the equation of the marginal revenue curve is $MR = 80 - Q$.



c. Profit is maximized at the quantity where marginal cost is equal to marginal revenue. Since $MC = Q$, this quantity is: $80 - Q = Q$, $2Q = 80$, $Q = 40$. To get the corresponding price, we plug this quantity into the demand equation and we get: $P = 80 - (40)/2$, $P = \$60$. In this graph, this profit-maximizing equilibrium is:

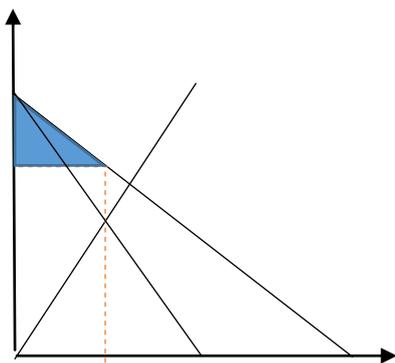


d. Profit is equal to total revenue less total cost. That is, $\pi = TR - TC$, where $TR = P \cdot Q$ and $TC = FC + VC$. From c, we have that $P = \$60$ and $Q = 40$. Fixed cost is given as \$400. Variable cost is calculated with the formula $VC = 0.5 \cdot (Q^2)$, so it's equal to $0.5 \cdot (40^2) = \$800$. Plugging in all the numbers, we get:

$$\pi = \$60 \cdot 40 - (\$400 + \$800) = \$2,400 - \$1,200 = \$1,200. \text{ Profit is equal to } \$1,200.$$

e. Consumer surplus is the difference between what consumers are willing to pay and what they end up paying. On the graph, consumer surplus is shown by the area of the blue triangle.

$$\text{Its value is } [\$ (80 - 60) \cdot 40] / 2 = [\$20 \cdot 40] / 2 = \$400.$$



Chapter 9: Games and Strategic Behavior

Review Questions

- 1.** A military arms race is an example of a prisoner's dilemma, because if a government invests in its military force, it will achieve a personal gain. If both governments invest in arms, the outcome will be inefficient on both sides. The efficient outcome is for the two governments to not invest in their respective military force. However, if one sticks to not investing and the other one invests, the one that did not invest will end up with a negative outcome. This is why both governments will follow the strategy of investing in a military force and end up with an inefficient outcome, similar to what happens in a prisoner's dilemma game.
- 2.** Warner Brothers made a mistake when they did this, because by waiting until the movie was almost finished to invite Tony Bennett to sing gave the singer a dominant strategy and put him in a position to negotiate for a higher pay, because he knew that without his appearance the script would not make sense. What the people at Warner Brothers should have done is to negotiate with Tony Bennett before they started shooting the movie. This way, the singer probably would have accepted the money he was being offered, because he would have known that even if he refused he probably knew that the script and be rewritten. Thus, it would have been better to accept what they offered him than to get nothing.
- 3.** The president of the small firm might refuse to make business with General Motors without a long-term contract fixing the price of door-handles, because without such a contract GM will be the one with a dominant strategy and his small firm end up at a loss instead of making a profit. It is stated in the problem that the equipment used to make the door handles is expensive to buy and cannot be used for anything else but for making door handles. That is, in the absence of a contract which fixes the price of door handles in the long run, GM might force the small manufacturing firm to lower the prices, knowing that the expensive machines cannot be used for anything else. That is, GM could negotiate for lower prices, knowing that the small firm does not have another alternative for using the expensive machinery but for producing door handles for their Pontiac sedans.
- 4.** If you are told that you can play the game an infinite number of times you can condition your choice of whether to defect or not based on the games you've already played. That is, if you and your partner can agree to not defect and if he does defect, in the following game you can do the same. In an infinite prisoner's dilemma game, not defecting can be used as a commitment device which determines the outcome of each successive game. So, your incentive to defect changes based on the outcome of previous games.
- 5.** The problem that narrowly self-interested diners and waiters would confront at restaurants located on interstate highways is that the waiter can choose between providing good or bad service and the diner can choose between leaving a tip and not leaving a tip. A problem arises because even if the waiter provides good service, the diner might not choose tip him, because this way he will end up with a higher financial surplus, so the waiter does not have a

guarantee that his good service will be rewarded by a tip so he might opt for providing poor service instead. I don't think that people are always selfish in the narrowest sense, because if you are even just a barely decent human being you would be willing to leave your waiter a tip in exchange for his or her good service instead of just keeping the couple of dollars you would have given to yourself.

Problems

1. a.

		-5 for Sam	10 for Sam
Study a lot		-5 for all others	-6 for all others
	Study a little	-6 for Sam	-1 for Sam
		10 for all others	-1 for all others

b. The equilibrium outcome is that all study a lot and receive an average grade. From the student's perspective the best outcome would have been for everyone to study a little and still get an average grade.

2. a. No, neither player has a dominant strategy, because the optimal choice for other player depends on the decision of the other player.

b. The two cells which could yield an equilibrium are the top left and the bottom right ones. This is so, because in each of the two the players do not have an incentive to change their strategy.

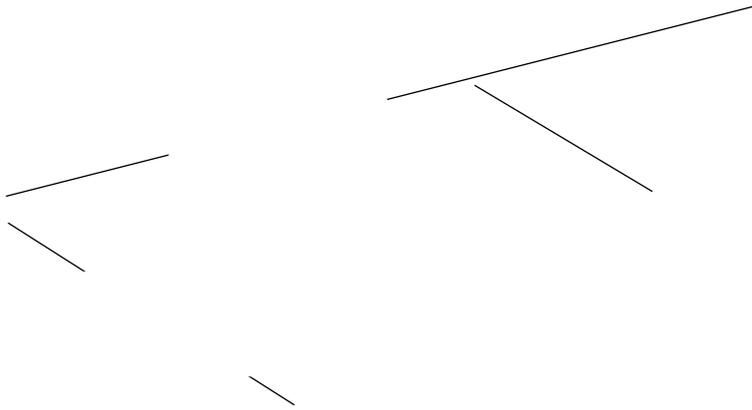
c. No, the players here do not face a prisoner's dilemma, because they are not faced with a dominant or a dominated strategy.

d. If A uses his first move to buy a movie ticket, B will do the same and A will receive of payoff of 2. However, if A uses his first move to buy a soccer ticket, B will follow suit and the payoff for A will be 3. Thus, the equilibrium outcome will be that both players will buy a soccer ticket.

e. B will receive a higher payoff if he uses his first move to buy a movie ticket, so in this case the equilibrium outcome will be that both of them will buy a movie ticket.

3. For Taalab this information is worthless, because first of all he knows that Qassi's dominant strategy is to confess. Second of all, independently of Qassi's decision, Taalab has a dominant strategy of his own, which is also to confess.

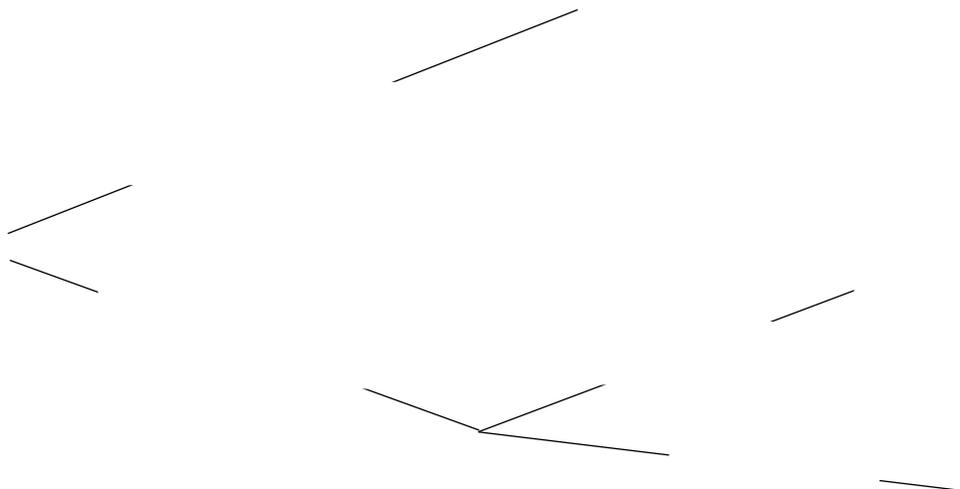
4.



a. Since the owner believes that all managers are only interested in maximizing their own personal profit, he will expect a weekly loss of \$600, because he thinks that a manager will embezzle. Thus he would choose to get \$0 instead of losing \$600 and will not open the new office.

b. Under these circumstances, the owner will choose to open a new office. This is so, because now the bottom branch of the manager's payoff will be $\$3,100 - \$15,000 = -\$11,900$ and the owner can know for sure that the manager will choose the \$2,000 payoff branch where the owner himself will get \$800 per week.

5. a.



b. The other driver would not choose the top branch of A because he would get nothing from it. Moving to the lower branch of A, the other driver knows that you would choose the lower

branch of B, because if you protested you would lose \$20. This is why he will steal your spot, you will not protest and will have to wait for another one. The equilibrium outcome is the lower branch of B.

c. If the other driver believed you that you have a psychological cost of not protesting equal to your \$30 cost of protesting, he would reason that your overall or net cost of him stealing your spot and creating grounds for an argument would be \$0. This will change the upper branch of B to a \$10 gain for you. In this case he would no longer gain from trying to steal your parking space.

6. a.

Keep quota	Second best for both A and B	Worst for A Best for B
	Best for A Worst for B	Third best for both A and B
Break quota		

Overfishing is inevitable in the absence of effective enforcement of the quota agreement, because the dominant strategy of both companies is to break the quota. That is, unless the quota is enforced in some way, both companies will choose to break it.

b. If I throw a wrapper directly on the ground I am saving myself the time I would waste on looking for a bin and the environment is not getting too polluted because it's just one wrapper and it will disintegrate. However, if everyone thinks this way, this source of pollution will become a serious problem.

c. Usually in situations like this one where environmental degradation is involved, the players usually do not know each other, so there is no way for character judgements to be involved.

7. a. The two players in the game are you and your friend. Both have the strategy choices of either heads or tails. The payoff matrix, showing the transfer of pennies, is drawn below:

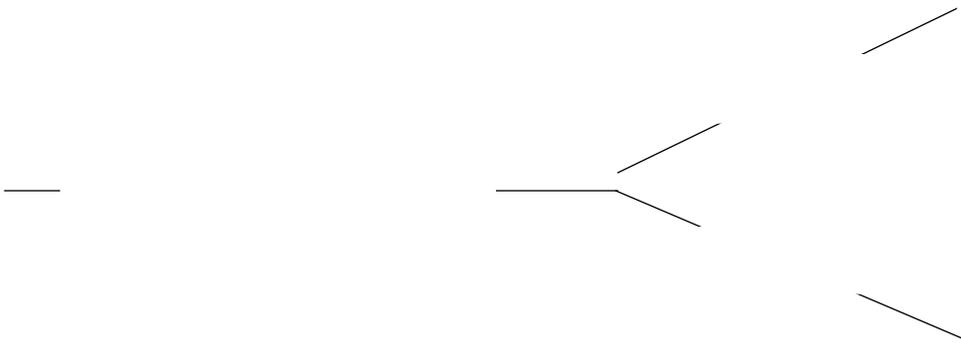
Heads	1 coin for you -1 coin for your friend	-1 coin for you 1 coin for your friend
	-1 coin for you 1 coin for your friend	1 coin for you -1 coin for your friend
Tails		

b. There is no dominant strategy.

c. There is no equilibrium either.

Note: The answers of b. and c. are such, because if your friend gets tails, you will want to get tails as well. However, if you do that, your friend will want to change his strategy to heads.

8. a. The players in the game are Hamid and Sarah. Hamid's strategies are associated with X – the number of coins he chooses to offer Sarah. Sarah strategies include to accept or to decline Hamid's offer. The decision tree for this game is depicted below:



b. Sarah's optimal choice is the upper branch at B on the decision tree, because there her payoff will be higher than \$0 no matter what X is. For Hamid the optimal choice is to set X equal to 1, because he knows that Sarah will choose the upper branch regardless of the value of X. This way Hamid's payoff will be $0.25 \cdot 3 = \$0.75$ and Sarah's payoff will be \$0.25.

9. a. The two possible equilibrium outcomes in this game are:

- Boeing produces and Airbus does not, and

- Airbus produces and Boeing does not. In these two cells neither company will want to change its strategy, because if one is producing, the other one will be better off if it does not produce.

b. If the European Union gives Airbus a \$25-million subsidy for entering the market, the new payoff matrix will look like this:

\$25 for Airbus -\$5 for Boeing	\$0 for Airbus \$100 for Boeing
\$125 for Airbus \$0 for Boeing	\$0 for Airbus \$0 for Boeing

Producing will become a dominant strategy for Airbus because of the subsidy. Due to this change, Boeing will choose not to produce.

c. Without the subsidy, we know that one of the companies will produce and the other will not, but we cannot be sure which will do what. With the subsidy there, the European Union is making sure that Airbus will be the company which gets to produce.

10. a. In this part of the problem, Abeer and Kabeer can make decisions independently of each other. Both of them can sell a pail for water for \$5 and the cost of carrying each one - \$2 and \$3 respectively, is less than \$5. This means that both Abeer and Kabeer will carry two buckets down the hill.

b. When the two children have to share equally their revenues, the payoff matrix is as follows:

\$3 for Abeer	\$5.50 for Abeer
\$3 for Kabeer	\$2.50 for Kabeer
\$2.50 for Abeer	\$5 for Abeer
\$5.50 for Kabeer	\$5 for Kabeer

The dominant strategy for both Abeer and Kabeer is to carry one pail of water, meaning that their parent’s plan did not work out as they were expecting.

Chapter 10: Externalities and Property Rights

Review Questions

1. When a driver enters a highway that is already jammed, it becomes more congested by a unit for the next driver who enters it. This repeats with every next driver, leading to excessive congestion. The problem here is that each separate driver does not take under consideration the impact that he himself has on highway congestion when he makes the decision to enter the highway.
2. Those activities which generate external costs also tend to be pursued excessively. As with any activity, the optimal quantity of activities generating external costs is at the point where the marginal cost of the activity is equal to the marginal benefit it brings. So, if such an activity becomes illegal, its marginal cost will be higher than its marginal benefit, so it will more from being pursued above its optimal amount to being pursued at a level much lower than its socially optimal amount. Thus, the enactment of such legislation would not be advisable.
3. Economists believe that pollution taxes and effluent permits are a more efficient way to curb pollution than laws mandating across-the-board cutbacks, because unlike those laws,

which place a burden on society as a whole, pollution taxes and effluent permits place the burden of pollution directly on those who pollute, which leads to a more efficient solution of the problem. Across-the-board cutbacks involve legal costs, which are born directly by taxpayers. What is more, they do not directly change the incentives of firms when it comes to reducing pollution.

4. To explain this issue you could use the cost-benefit principle. The socially optimal level of congestion on a highway occurs when the marginal benefit drivers on the highway receive from a shorter travel time, equals the cost of expanding the highway's capacity. If we say that the optimal amount of highway congestion is zero, it would mean that the marginal benefit of an additional unit of highway capacity is equal to zero. This reasoning is irrational, because the marginal benefit of additional highway capacity should always be a positive number. From here it follows that the optimal amount of highway congestion is not equal to zero.

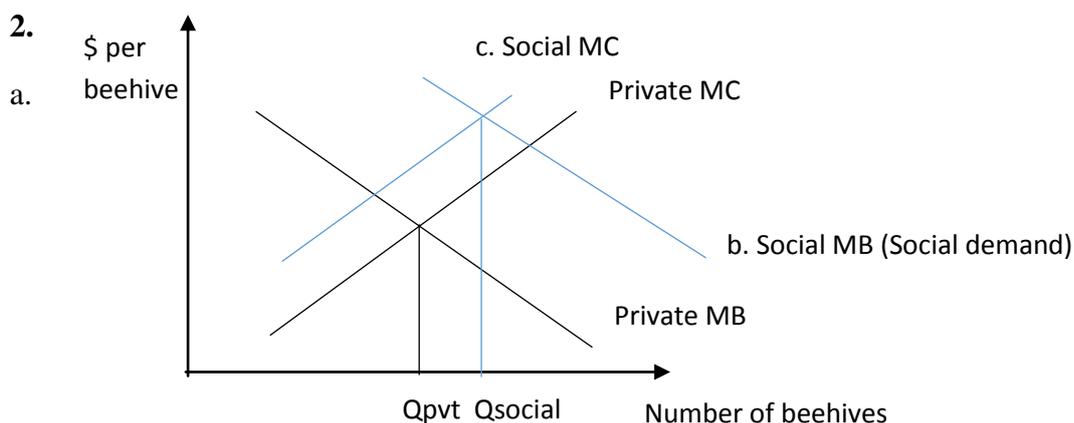
5. It is more difficult to enact legislation that curbs pollution when it comes to Lake Erie, because it is bordered by several governments, each of which has its own peculiarities when it comes to this type of legislation, so it will be troublesome for all of them to work in unison. This is why the Great Salt Lake, which is located wholly within the state of Utah, will suffer lower levels of pollution.

6. The wearing of high heels might be viewed as the result of a positional externality, because the first person to wear high heels has a height advantage, which causes others to change the perception they have of that person. This altered perception might bring additional benefits like, for example, a raise. However, the benefit of wearing heels will not be as great for the second person who does it, because it will not be something new and unseen for those around him or her. Thus, only the first one to do it receives an economic rent from it.

Problems

1. a. True. This is so, because if the marginal cost of curbed pollution is higher for one firm in the industry than it is for another, let's say firm A and firm B, respectively, the total cost could be lowered by transferring pollution emissions from firm B to firm A.

b. True. A good example for this is the extensive use of different chemicals and pesticides on agricultural crops. By doing this, farmers reduce the damage different insects do to their crops and, thus, they lower their production costs. However, the chemicals they use pollute waterways, which is a negative externality for people who make some use of those waters.



d. From the diagram we can see that the socially optimal quantity of beehives (Q_{social}) is higher than the privately optimal quantity. This is so, because, from the way the diagram is drawn here, we can see that the difference between the social MB and the private MB is much larger than the magnitude between the social MC and the private MC. However, if it was the other way around – the magnitude between the social MB and private MB were lower than the difference between the social MC and the private MC, the socially optimal quantity would be lower than the privately optimal quantity.

3. To find the equilibrium number of boom boxes we equate supply and demand and we get:

$$5 + 0.1Q = 20 - 0.2*Q$$

$$0.3*Q = 15, Q = 50 \rightarrow \text{The equilibrium number of boom boxes rented is 50.}$$

To get the socially optimal number of boom boxes rented we have to find the Social MC equation. We do this by adding the unit noise cost of \$3 to the Private MC cost and we get: $P = 8 + 0.1*Q$. To find equilibrium we equate demand to the Social MC and we get:

$$20 - 0.2*Q = 8 + 0.1*Q$$

$0.3*Q = 12, Q = 40 \rightarrow$ The socially optimal quantity of boom boxes rented is equal to 40, that is, it is 10 boom boxes less than the equilibrium quantity of boom boxes rented, which is as we found is 50.

4. The \$3 tax per unit on each daily boom box will shift the Private MC curve and will make it identical to the Social MC curve. This means that now the number of boom boxes rented will be the socially optimal one. Thus, the tax will lead to an increase in this market's efficiency.

5. The total surplus per day if Jaafar emits smoke is \$600. In the case that he does not emit smoke the total daily surplus is \$580. Thus, the more efficient outcome would be for Jaafar to emit smoke. Because Samir can forbid Jaafar from emitting smoke, he has to be in some way compensated in the case when smoke is being emitted. To compensate Samir, Jaafar can pay him \$30. This way, both of them will be better off by \$10 than if Jaafar was prohibited from emitting smoke by Samir.

6 a. Since there is no regulation the two firms will opt for the cheapest process, which is process A, bringing a total daily cost of \$150 to the two companies and causing daily smoke emissions of eight tons.

b. If each firm is required to curb its emissions by 50%, both of them will now have to use production process C, which causes the emission of four tons per day – two tons for each firm. The cost to Sludge oil to do so will be the extra \$70 in expenses which production process C causes it to incur (\$120-\$50). The cost to Northwest Lumber will be \$400 (\$500-\$100), making a total cost to society of \$470.

7. Here, instead of asking each firm to cut pollution by half, the city council wants to take total emissions down from eight tons to four tons and it plans to do so by imposing a tax of $\$T$ on each ton of smoke omitted, meaning that by cutting pollution by one ton per day, each firm will be able to save $\$T$ in tax dollars. At the current production process A, each firm has to pay $4*\$T$ in taxes, because each emits four tons of smoke per day. So each firm will have an incentive to cut pollution by a tone as long as the cost of doing so is lower than $\$T$. So if we impose a tax of $\$81$, Sludge Oil will be willing to cut pollution by three tons and will start using process D, because the $\$150$ cost of doing so ($\$200-\50) is lower than the $\$243$ ($\$81*3$) it saves in taxes. Under the $\$81$ tax Northwest Lumber will cut pollution by a ton and will start using production process B emitting three tons of smoke per day, because the $\$80$ cost of doing so ($\$180-\100) is lower than the $\$81$ it saves in tax dollars. Since Sludge Oil's smoke emission is now one ton and that of Northwest Lumber is three tons, the city council has reached its goal of reducing pollution to four tons by means of implementing a $\$81$ tax on each ton of smoke emitted. The total cost of reduction under this policy will be $\$230$ ($\$150+\80), which is lower than the cost of $\$470$ we got in the previous problem.

8. Each firm will be willing to buy a permit, as long as its price is lower than or equal to its marginal abatement cost, in this case the cost it incurs from cutting pollution by one ton each day. Since for Sludge Oil the marginal abatement cost for the first three tons (respectively $\$20$, $\$50$, and $\$80$) than that of Northwest Lumber (respectively $\$80$, $\$320$, and $\$500$), it will be the one to buy the first three permits, for $\$20$, $\$50$ and $\$80$. The fourth permit will go to Northwest Lumber for $\$80$. This way the total cost will be equal to $\$230$ (the sum of the prices of all the permits).

9. By living together Jamal and Kamal can save a total of $\$200$ in rental expenses each month. The least-costly way to solve the dirty dishes problem would be for Jamal to leave them in the sink. This way, the maximum rent Kamal would be willing to pay to share an apartment with Jamal will be $\$350 - \$175 = \$175$ per month. This would leave Jamal with a monthly rent of $\$325$, which generates a $\$25$ surplus. He can split this surplus with Kamal and they will end up paying $\$337.50$ and $\$162.50$. We get to the conclusion that both of them would be better off sharing.

10. When the cost of the shared living arrangement is raised by $\$30$ per month the total cost of sharing becomes $\$205$. This is higher than the $\$200$ Jamal and Kamal save by living together, meaning that in this case they would choose to live separately.

11. a. Badr's monthly payoff without soundproofing is $\$50$ higher than with soundproofing, he would prefer to not install soundproofing. In order to induce him to install soundproofing, Saqr would have to pay Badr at least $\$50$. However, for Saqr values soundproofing at only $\$40$ per month, so he will not bother to pay Bard to install soundproofing. The joint payoff with soundproofing is $\$220$ and without it it's equal to $\$230$. This means that their choice to not install soundproofing is socially efficient.

b. No, Bard will still not install soundproofing. He would rather pay $\$40$ to Saqr to compensate him for the noise. This solution is also socially efficient.

c. Not really, because the same result was obtained in both a. and b., that is, the same result was obtained both with Badr having the legal right to make noise and with Saqr having the legal right to peace and quiet.

12. a. In this case Badr will install soundproofing, because the \$50 cost of doing so is less than the \$60 he has to give to Saqr as compensation if he were to not install soundproofing. The outcome is socially efficient.

b. Saqr is willing to give \$60 to Badr to induce him to install soundproofing. However, Saqr will not bother to do so when he also has to pay an extra \$15 per month in order to be able to negotiate with Badr. Under these conditions Badr will not install soundproofing and the outcome will be socially inefficient.

c. In this case, it will be cheaper for Badr to install soundproofing instead of negotiating with Saqr and compensating him for the noise. Thus, soundproofing will be installed and the outcome will be socially efficient.

d. This is so, because in b. the negotiation costs fell on Saqr and they outweighed the gains of implementing the most efficient accommodation to the sound problem, so soundproofing was not installed. In c. when the negotiation costs fell on Badr, so he had to install soundproofing.

13. We can construct the following table for simplicity:

Number of llamas of the commons	Price per 2-year-old llama (\$)	Income per llama (\$ per year) (a llama costs \$100)	Total income for the village (\$ per year)	Marginal income (\$ per year)
				\$22
1	\$122	\$22	\$22	
				\$14
2	\$118	\$18	\$36	
				\$12
3	\$116	\$16	\$48	
				\$8
4	\$114	\$14	\$56	
				\$4
5	\$112	\$12	\$60	

				-\$6
6	\$109	\$9	\$54	

a. From the table we see that it will be efficient to send three llamas onto the commons, because after the third llama it becomes more profitable to invest in bonds (i.e. the fourth llama gives a yearly income of \$14, while the bond results in a \$15 yearly return). The net village income will be \$48 from the llamas plus an additional \$45 interest earned from government bonds ($0.15 \times \$300$), making a total of \$93.

b. The socially optimal number of llamas for the village is one. The reason the village people send three llamas is because when making the decision individually they do not consider the fact that the number of llamas sent onto the commons affects the quality of fleece. The one llama earns the village \$22. The remaining \$500 invested in government bonds earn an interest of \$75, making the village's total income at the socially optimal number of llamas equal to \$97.

c. If access to the commons fell in the hands of only one villager, he or she would buy one llama and sell it for \$122 in a year, earning \$22 on it. If he or she did not pay for the land, she would earn \$7 more on raising a llama than on buying a bond ($\$22 - \15). The villagers would bid up the price of the right to control access to the commons until the benefit of owning the land is the same as depositing the same amount of cash in a bank at 15% interest. That price is the same amount of money that will give you \$7 at the end of the year if it was deposited in a bank at 15%. That is, the price to own the land (the right to control access to the commons), let's call it x is equal to:

$$x \cdot 0.15 = \$7$$

$$x = \$46.67$$

Thus, the right to control access to the commons will sell for \$46.67.

Chapter 11: The Economics of Information

Review Questions

1. It would be impossible, and useless, for a person to gather information on the peculiarities of each and every car model in the market. What a rational consumer would do in such a case is compare different car models and brands until the marginal cost of gathering information is equal to the marginal benefit gained from having that information. Thus, a consumer will most probably make a decision before test driving all models by all manufacturers in the market.

2. Suppose that the painter's reservation price is \$1,000 and he finds a buyer who is willing to pay \$5,000 for the painting. This way the surplus created will be \$4,000. However, since part of the gallery owner's job is matching artworks with potential buyers, he might be able to find a buyer who is willing to pay even more for the painting, say \$10,000. This way the surplus

created will be \$9,000. Thus, a gallery owner who sells a painting might create more economic surplus than the artist who painted it.

3. To explain this statement we can first assume the opposite – that used cars offered for sale are the same, on average, as used cars not offered for sale. In this case the price of a used car in a poor condition will equal the value of a used car in an average condition. This way the owner of a used car in an above-average condition will not be willing to sell his car at a price that undervalues it and the owner of a used car that is in a poor condition would be more than happy to sell his or her car at a price that overvalues it. Thus, the market would be flooded with used cars in a poor condition. However, since the market is not set up like that, there is in fact a difference in the quality of used cars offered for sale and used cars not offered for sale.

4. The used-car market would be more likely to function efficiently in a community in which moral norms of honesty are strong than in a community in which such norms are weak, because in a community with strong moral norms, the sellers of used cars would be honest about the true conditions of their cars and, thus, the price of the cars being sold would reflect their true value.

5. By driving a Porsche the aspiring film producer will be able to seem more successful than he actually is (because, successful and wealthy film producers are the ones who in reality tend to drive Porsches). By looking successful, people will assume that the aspiring film producer is in fact a successful film producer and because of this they will be more willing to provide him with funds and support his ideas.

Problems

1. a. The amount spent on the advertisement says more about quality than the message the advertisement carries. That is, a company would not spend millions advertising a low quality product, because this way the best they would get is just people trying the product once and not buying it again and again.

b. True. This is so, because it would be difficult and impractical to charge non-buyers for advice, what is provided as retail service is less than the socially optimal amount.

c. False. The best-dressed lawyer is not necessarily the best lawyer. You can be sure that your lawyer is good only when you have gone through all the available information on the lawyers you can hire and their quality.

d. True. The benefit from searching for a spouse in a big city is larger than the benefit from searching for a spouse in a small city, because in a big city you have a greater number of potential spouses you can choose from.

2. Because nondefective cars are valued by consumers at \$10,000, and cars do not depreciate with use, all used cars that are being sold will be defective ones. Used cars are sold for \$2,500, meaning that \$2,500 is the value consumers place on defective cars. The reservation price for a new vehicle for a risk-neutral buyer (\$5,000) is equal to the value of a nondefective car (\$10,000) multiplied by the probability of getting a nondefective car $(1-x)$ plus the value of a defective car (\$2,500) times the probability of getting a defective car (x) . So to find x we

can use the following equation: $\$5,000 = (1-x)*\$10,000 + x*\$2,500$
 $x = 2/3$.

3. Yes, Farid will hire a realtor. This way he will sell the house for \$250,000. He will give the realtor \$12,500 – 5% of the sale price. What will be left for Farid is \$237,500, which Carlos will hire the realtor, because he will sell the house for \$250,000 and pay the realtor economic surplus would have been \$10,000 for both Farid and Hamid – a total of \$20,000. With a realtor the total economic surplus is \$107,500(=\$237,500-\$130,000), \$50,000 to whoever buys the house (\$300,000-\$250,000) and \$10,500 (he has an opportunity cost of \$2,000 for negotiating a sale), making a total of \$168,000.

4. Bushra is the one who would benefit more from hiring a realtor to assist in selling her house. This is so, because the house Aziza is selling is of a standard, well-known type, meaning that it has a lot of potential buyer so it will not be difficult for her to find a qualified buyer on her own. Bushra, however, is selling an unusual house, which is more likely to have buyers, who are fewer and are less informed and interested than in the case of Aziza. This is why a realtor who knows the market and has an idea of what the potential pool of buyers is will be of more help to Bushra.

5. a. For elementary school teachers, salaries do not tend to vary too much, so not a lot can be told about a teacher's ability from the type of car that she drives. Conversely, real estate agents are paid on commission, so the more skilled a realtor is and the more deals she closes, the better car she is likely to drive, so in this case a car can be a good indicator of a realtor's ability.

b. The car he or she drives will be a better indicator of ability for the dentist than for the municipal government administrator for basically the same reason as in a.

c. The car he or she drives will be a better indicator of ability for the engineer in the private sector than for the engineer in the military for basically the same reason as in a.

6. The expansion of Internet access will increase the number of people in the brokerage business, so the supply curve for brokerage services will shift to the right. This will lead to a lower price of brokerage services, which will lower the incomes of the brokers who serve less customers by doing business the traditional way.

7. a. Company stock is a standardized commodity which will make its exchange over the Internet easier than that of legal services, which are highly dependent on the specific needs of a client. This is why increased Internet access will have a much larger impact on stockbrokers than on lawyers.

b. Increased Internet access will have a much larger impact on pharmacists than on doctors for basically the same reasons as in a.

c. Increased Internet access will have a much larger impact on bookstore owners than on owners of galleries that sell original oil paintings for basically the same reasons as in a.

8. As people's access to the Internet grows, the number of film actors and musicians who have active fan clubs will grow, because in the absence of Internet access the fans of obscure artists will be too small for them to be able to find each other and gather with the purpose of making a fan club. However, the Internet enables people with common interests to find each other easily, meaning that even the fans of artist who are not too famous will be able to 'gather' in a way and create online fan clubs.

9. Buying pottery from an auction is more time-consuming than purchasing it straight from a dealer because in this case he is the one who has to sit through auctions in order to buy the artworks he then sells to his customers. Since Farid is retired, his opportunity cost of sitting through an auction is lower than that of his brother Jamal who is still working. Thus, Farid is the one more likely to buy his pottery at auctions. He is also the one who is more likely to be paying a lower price for the pottery, because when hiring an art dealer one also has to pay the dealer some sort of monetary compensation for his work.

Chapter 12: Labor Markets, Poverty and Income Distribution

Review questions

1. The reason why the labor supply curve for any specific occupation is likely to be upward-sloping, even though, for the economy as a whole, people work fewer hours when wage rates increase, is because the differences in wages that exist among occupations tend to influence occupational choice. That is, the higher the wages for a particular occupation become, the greater the supply of labor for that occupation will be.

2. True. According to the human capital theory a worker's wage will be proportional to his or her human capital. Thus, if the human capital possessed by two workers is nearly the same, it is true that their wages will be nearly the same as well. However, if one of the individuals is a member of a labor union and the other is not, the one who is in the union is likely to receive a higher wage.

3. Income inequality has increased in recent years, which can be explained by the fact that individuals who were already more productive and were earning more on average have gained access to technologies which let them serve broader markets. This has occurred at the expense of less productive workers, who have not been able to keep up with those technological innovations, leading to an increase in income inequality. That is, income inequality has increased in recent years due to the proliferation of skill-biased technology.

4. There are several factors which could explain why a top earner might act in self-interest by favoring income redistribution. For example, people who are rich value a marginal dollar less than people with an average to low income. Thus, if rich people have their holding of money decreased due to income redistribution they will be able to enjoy the marginal dollar by a larger amount. Another reason is that, if income redistribution is present, social unrest and revolutions are less likely to occur, which is good for rich people, because they tend to be the main victims of such events.

5. In the presence of a negative income tax people whose income falls below a certain threshold receive a subsidy instead of getting taxed. However, if a person receives a wage that is even a bit larger than that minimal threshold level, he will get taxed on his income. This is a strong incentive to work and earn less, because this way you will receive a subsidy instead of being taxed. For this reason exclusive reliance on a negative income tax is not likely to constitute a long-term solution to a poverty problem.

Problems

1. Sarah's monthly marginal product of 60 air filters, making her value of marginal product of labor (VMP) per month equal to $$(26-1)*60 = \$1,500$. Badr assembles 70 air filters per month, making his VMP equal to $$(26-1)*70 = \$1,750$. It is said in the problem that the labor market is competitive, which means that workers will earn their VMPs each month. Sarah will be paid \$1,500 and Badr will receive \$1,750 per month.

2. a. Since jeans cost \$5 to make and are sold for \$35, Stone, Inc. makes \$30 from every pair of jeans sold. In order to find out how many workers will be hired and how many pairs of jeans will be made given the competitive market wage of \$250 per week, we can construct the following table:

Number of workers	Jeans (pairs per week)	Marginal product of labor (MP) (pairs per worker)	VMP (\$ per week) (= \$30*MP)
0	0		
		25	\$750
1	25		
		20	\$600
2	45		
		15	\$450
3	60		
		12	\$360
4	72		
		8	\$240
5	80		
		5	\$150
6	85		

Given that the market wage \$250 it will not be worth it to hire the fifth worker whose VMP is \$240 so the company will hire four workers and will produce 72 pairs of jeans per week.

b. The minimum wage does not affect Stone, Inc., because the market wage of \$250 it is currently paying is above the \$230 minimum wage. It will continue hiring four workers and making 72 pairs of jeans per week.

c. This time the minimum wage of \$400 is above the market wage and it will affect the number of workers hired. Stone, Inc. will now hire only three workers because the fourth worker's VMP is \$360 and will produce 60 pairs of jeans per week.

d. If the price of jeans rises to \$45 and the cost of making a pair is \$5, the company will make \$40 from each pair sold. The final column of the above drawn table will now change:

Number of workers	Jeans (pairs per week)	Marginal product of labor (MP) (pairs per worker)	VMP (\$ per week) (= \$40*MP)
0	0		
		25	\$1,000
1	25		
		20	\$800
2	45		
		15	\$600
3	60		
		12	\$480
4	72		
		8	\$320
5	80		
		5	\$200
6	85		

Since the market wage is \$250, the company will now hire five workers (the sixth worker's VMP is \$200) and will produce 80 pairs of jeans per week.

3. Since a rocket ship sells for \$30,000 and components for each rocket ship cost \$25,000, Acme makes \$5,000 from each ship it sells. Since the labor market is perfectly competitive Walid and Sami will each be paid their value of marginal product of labor (VMP). Walid can assemble 1/10 of a rocket ship per month, so his VMP and wage will be equal to \$500. Sami can assemble 1/5 of a ship per month, making his monthly VMP and wage equal to \$1,000.

4. a. The fact that a case of soda sells for \$10 more than it cost to make means that Bashra makes \$10 from each case sold. To find out how many workers will be hired and how many cases will be produced per week at a wage of \$1,000 we can construct the following table.

Number of workers	Cases per week	Total revenue (\$ per week) (= \$10*case)	VMP (\$ per week) (=)
0	0		
			\$2,000
1	200	\$2,000	
			\$1,600
2	360	\$3,600	
			\$1,200
3	480	\$4,800	
			\$600
4	560	\$5,600	
			\$400
5	600	\$6,000	

Since the competitive market wage is \$1,000 Bushra will hire three workers (since the VMP of the fourth one is \$600). At this rate, 480 cases of soda will be produced per week.

b. If there is a minimum wage of \$1,500 set by a union, Bushra will now hire two workers and produce 360 cans of soda per week (the VMP of the third worker is \$1,200).

c. If the profit Bushra now makes from each case rises to \$15 the last column of the table will change:

Number of workers	Cases per week	Total revenue (\$ per week) (= \$15*case)	VMP (\$ per week) (=)
0	0		
			\$3,000
1	200	\$3,000	
			\$2,400
2	360	\$5,400	
			\$1,800
3	480	\$7,200	
			\$1,200
4	560	\$8,400	
			\$600
5	600	\$9,000	

Bushra will now hire four workers and make 560 cans of soda per week (the VMP of the fifth worker is \$600).

5. Since the new \$6 minimum wage is still below the market equilibrium wage of \$7 the increase will have no effect on wages and employment.

6. a. Since Jamal loses \$0.40 from a dollar of his vouchers for every dollar he gets paid, his benefits in each program will fall by \$48 ($\$0.40 * \$120 = \48), making a total fall of \$144 ($\$48 * 3$). This means that before getting a job Jamal had an income of \$450 ($\$150 * 3$) in vouchers, and now that he has a job, his income amounts to \$120 plus \$276 ($\$450 - \144), making a total of \$396. Thus, without a job, Jamal earns \$54 less ($\$450 - \396) than when he was unemployed.

b. As we saw in part a. means testing for welfare recipients might have a negative effect on work incentives, because the income of a person can go down as a result of his participation in the labor market, this way discouraging him from working.

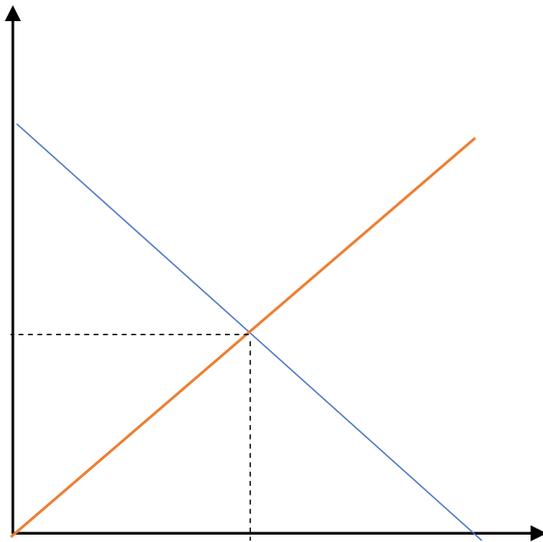
7. a. If Salma is paid \$100 per hour and her reservation wage is \$10 per hour her economic surplus will be $\$100 - \$10 = \$90$.

b. If the \$100 were divided equally among the 400 students living in Salma's dorm, each person would earn \$0.25. In this case Salma's economic surplus would be $\$0.25 - \$10 = -\$9.75$ so she will not take the job.

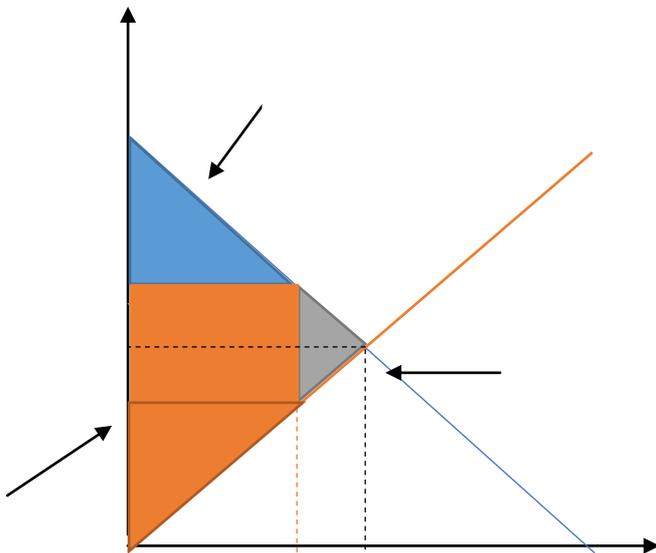
c. The income redistribution program in part b., discourages Salma from taking a job because it will generate a negative economic surplus. In the absence of the program would have generated for her a large economic surplus. Thus, in the case of such income redistribution

programs the labor supply falls, because people's reservation prices tend to be higher than the wage that is being offered.

8.



Without a minimum wage, employer surplus and worker surplus are both equal to \$50,000 per day ($\$10 \times 10,000 / 2$). In the presence of a minimum wage of \$12 per hour we get the following graph:



After the minimum wage is implemented, employer surplus falls to \$32,000 ($\$8 \times 8,000 / 4$), worker surplus rises to \$64,000 [$\$(4+12) \times 8,000 / 2$], and total surplus falls by \$2,000 ($\$4 \times 2,000 / 2$) due to the deadweight loss that arises because of the min wage requirement. Thus, employer surplus falls by \$18,000 per day and worker surplus rises by \$14,000 per day as a result of the implementation of a minimum wage requirement.

Chapter 13: Public Goods and Tax Policy

Review Questions

1. a. Definition of a non-rival good: a good whose consumption by one person does not diminish its availability for others. Of the goods listed here the non-rival ones are street lighting on campus and radio broadcasts. Apples are rival goods, because if a person eats an apple, there will be one less apple for other people to eat. Naguib Mahfouz are rival goods in the sense that difficult for two or more people to be reading a copy at the same time

b. A non-excludable good is a good that is difficult, or costly to exclude nonpayers from consuming. From the goods listed here the non-excludable ones are street lighting on campus and radio broadcasts.
2. a. Goods that are rival but non-excludable are berries in the forest or fish in the ocean.

b. Goods that are non-rival but excludable are cable TV and websites which provide, for example, financial news in exchange for a subscription fee.

c. Goods that are both non-rival and non-excludable are public parks and radio broadcasts.
3. The reason why even a wealthy person might prefer a proportional income tax to a head tax is because the higher a person's income is, the higher his willingness to pay for a public good is likely to be. Under a head tax poor and wealthy people have to pay the same amount, meaning that the people with a high income will get a less public goods than they desire despite their readiness to pay more, and thus, receive more. With a proportional tax, rich people can pay a higher amount for public goods, this way making the outcome better both for them and for the poor.
4. Tue. Usually, activities which generate negative externalities also tend to be pursued excessively in the absence of a tax, which makes the aforementioned activities not as attractive as before, which in turn makes their allocation more efficient. What is more, the revenue which the tax generates can be used to pay for public goods.
5. The direct loss in surplus which would result from a tax on the good is an overstatement of the loss in surplus which the tax will actually cause, because we not taking under the consideration the public goods financed by the revenue which the tax will raise.

Problems

1. a. The most a guard can charge per month and still be assured of being hired is \$150 – the maximum amount Jamal is willing to pay him.

b. The plan will not be voted in because under it Jamil will have to pay \$60 for a service he values at \$10 and he will not be willing to do it. Here, without a guard economic surplus is $\$50 + \$150 = \$200$. Without a guard the surplus to Jamil will be $-\$10(=\$50-\$60)$ and to Jamal it will be $\$90(=\$150-\$60)$ making a total of \$80, meaning that economic surplus will be higher if the neighborhood does not have a guard.

2. a. If there is a 1% income tax for both of them, Jamil will have to pay \$10 and Jamal will have to pay \$110. Both amounts are below the reservation prices for a guard so both of them would accept the tax.

b. If each of them receives the same net benefit from hiring a guard we can construct the following set of equations:

Amount Jamil pays for a guard = \$x

Amount Jamal pays for a guard = \$y

$$\text{\$x} + \text{\$y} = \$120 \quad (\text{\$x} = \$120 - \text{\$y})$$

$$\$50 - \text{\$x} = \$150 - \text{\$y}$$

$$\$50 - \$120 + \text{\$y} = \$150 - \text{\$y}$$

$$2 * \text{\$y} = \$220$$

$$\text{\$y} = \$110 \rightarrow \text{\$x} = 10$$

This means that Jamil will have to pay \$10 and Jamal will have to pay \$110 for a guard under this tax scheme. Since the amounts they have to pay are below their reservation prices, both of them will accept the tax scheme.

c. The problem is that in order to implement this scheme both of them have to state the maximum amount they would be willing to pay for a guard. This way they have an incentive to understate this amount hoping that the other party will be willing to pay more and be taxed a higher fraction.

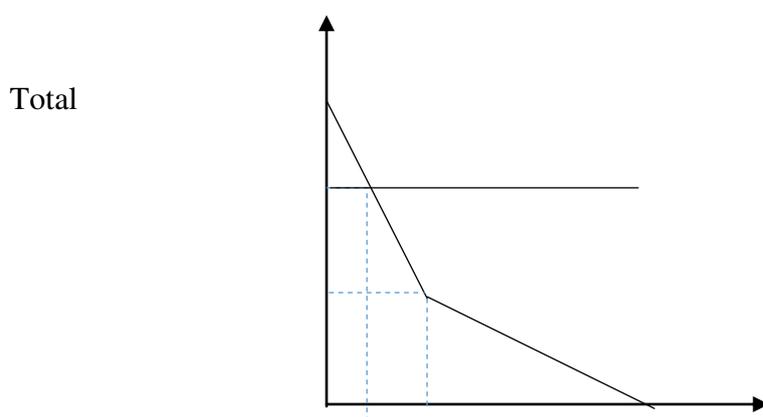
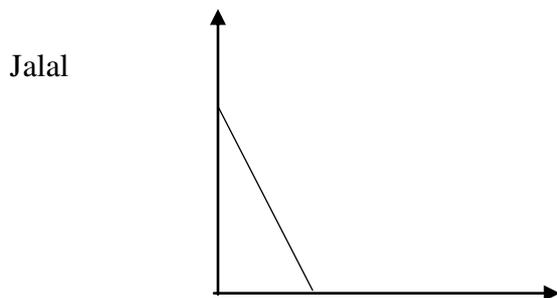
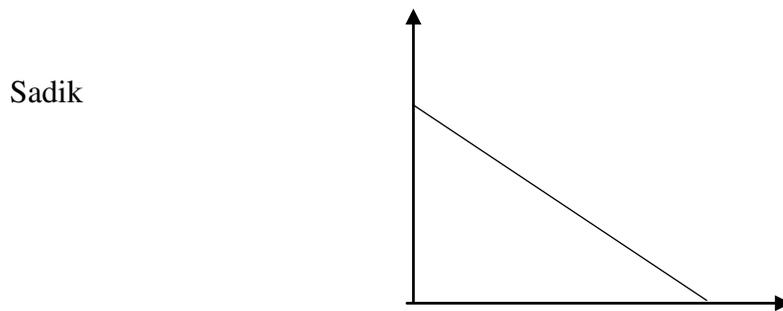
3. a. If the pool is financed by a weekly head tax levied on all voters and the cost of the pool is \$18 per week it means that each of the three citizens will have to pay a lump-sum tax of \$6. This means that the pool will not be built, because the reservation prices of voters B and C - \$5 and \$2, respectively, are lower than the \$6 tax. This outcome is not socially efficient, because the total cost per week is lower than the total weekly benefit.

b. The marginal cost for a monopoly is zero, so its profit maximizing price will be that maximized total revenue per week. This would be the price of \$12, which voter A is willing to pay. However since the fixed weekly cost of maintaining the pool is \$18, the monopolistic firm would lose \$6 every week (\$18 - \$12) so it there will not be a monopolistic firm willing to manage the pool. Once again, a socially efficient outcome will not be achieved.

4. a. If the monopolistic firms can now perfectly price-discriminate they can charge each voter his or her reservation price, so it will be able to make a weekly economic profit of \$1 (\$12 + \$5 + \$2 - \$18). This means that at the weekly interest of \$1, the present value of the profit stream from the pool is \$100. Thus, the monopoly franchise should be sold. Under these conditions a pool will be built and a socially efficient outcome will be reached.

b. Each of the firm has a 25% chance of winning if all firms spend the same amount on lobbying, making the profit of the winning firm 25 cents per week minus the amount spent lobbying. However if a firm spends more than its competitors in lobbying, it will be able to earn the whole dollar in monopoly profit, meaning that, as illustrated in the \$20 bill example, they might spend on lobbying than the amount they will earn from the business.

5. a. b. To construct the demand curve we need to find the individual demand curves of Sadik and Jalal and sum them vertically.



b. As we can see from the graph, the marginal cost curve intersects the demand curve at a number of three hours, so the socially optimal number of hours of opera broadcasts is three.

6. a. When it comes to filling in the two remaining slots in its fall lineup, the network will choose the programs which will bring it the highest profit. Since an episode of Big Brother

attracts 12 million viewers and the payment the network receives from Barbican is \$0.10 per viewer, the revenue it will generate from broadcasting Big Brother is \$1.2 million. Similarly, given that Super Star attracts eight million viewer, the network will earn \$800,000 from broadcasting it. Subtracting the \$400,000 production costs, the net profit the network will earn \$800,000 from an episode of Big Bother and \$400,000 from an episode of Super Star. The profit it makes from the weight-loss program commercials is equal to \$500,000. This means that company will be maximizing profits if for the first slot if broadcasts Big Brother and if it chooses the weight-loss program commercials for the second one.

b. To see if this outcome is socially efficient we need to find the economic surplus generated. The surplus of the weight-loss commercials as stated is equal to \$5 million. We find the economic surplus generated from Big Brother and Super Star by computing the area under their respective demand curve. For Big Bother it is equal to $\$8 * 12 / 2 = \48 million and for Super Star it is $\$16 * 8 / 2 = \64 million. We see that the outcome is not socially efficient, because the optimal social outcome would be generated from broadcasting the two TV programs instead of the weight-loss commercial, since both of them have a consumer surplus higher than \$5 million.

7. In the case of a pay-per-view network, the price is set at a point along the demand curve where the marginal cost and marginal revenue are equal. Because the marginal cost is equal to zero, the profit-maximizing price in this case is \$8 for each episode of the show. Thus, the revenue will be equal to \$32 million, and the economic surplus of the viewers will be equal ot \$16 million, making total economic surplus equal to \$48 million. In the case of showing Super Star on a not-for-profit channel free of charge, the viewer surplus will be equal to \$64 million, and the surplus of the pay-per-view network will be zero, making total economic surplus equal to \$64 million. Thus in the case of the not-for-profit network the economic surplus is \$16 million higher than in the case of the pay-per-view network.

8. a. This one is false since the pay-per-view company is charging a positive price for a good that is non-rival, making the outcome not a socially efficient one.

b. Also false. This is so, because having to give a pay-per-give fee will not attract the largest possible number of viewers, which in turn would be the factor maximizing advertising revenues.

c. False, because on broadcast TV the marginal cost to a viewer is zero.

d. This one is also false, because requiring a positive price for a good which is non-rival will cause an even bigger loss in surplus than choosing a wrong program.

e. True since under a pay-per-view service viewer can choose to watch more than what is given to them by the lowest-common-denominator programs which are preferred and financed by advertisers.

9. The correct answer is e. The statement in part c. the one which is not a reason for the existence of the free-rider problem, because although the incentive describe does exist in the circumstances of the context it does not cause the free-rider problem.

10. In order to solve the problem we can construct the following table:

Citizen	Marginal benefit from museum (\$/year)	Net benefit after tax (\$/year)	Single-price monopolist's revenue (\$/year)	Price-discriminating monopolist's revenue (\$/year)
Amr	340	140	340	340
Bard	290	90	580	630
Cantara	240	40	720	870
Dalal	190	-10	760	1,060
Bilal	140	-60	700	1,200

a. Since Amr, Bard and Cantara are the ones whose net benefit after the \$200 tax is positive, they are also the ones who will vote for the museum. Since three out of five vote in favor of building it, the referendum will pass.

b. From the third column we see that a single-price monopolist can raise a maximum amount of \$760 by charging each citizen a fee of \$190. However, this revenue does not cover the museum's costs of \$1,000 per year so no company would offer to build the museum under these conditions.

c. If a company can price-discriminate it will be able to earn a maximum revenue of \$1,200, which covers the museum costs of \$1,000 and also generates a \$200 profit, meaning that the maximum amount a private company would bid to build the museum is \$200.

Chapter 14: Spending, Income and GDP

Review Questions

1. Economists use market value when calculating GDP because market values provide a convenient way to add together (or aggregate) the many different goods and services produced within a certain economy. The reason more weight is given to high-priced items when calculating GDP is that the amount people are willing to pay for an item is an indication of the economic benefit they expect to receive from it.

2. The fact that farmers both produce and consume the food implies that GDP will be shown as lower than it actually is, because the food produced is not traded as a good on a market, and is consequently not included as part of GDP.

3. Consumption (C)

- consumer durables: a fridge
- consumer non-durables: a chocolate bar
- services: a taxi ride

Investment (I)

- business fixed investment – and industrial sewing machine

- residential investment – an apartment building

- inventory – a car that did not sell during the fiscal year, and is purchased by the firm itself to be sold during the following year

Government spending (G) – a teacher’s salary at a public school

Net exports (NX)

- exports – tobacco imported from another country

- imports – tobacco exported to another country

Yes, an expenditure component can be negative. For example: government spending can be negative in the case of a budget deficit. Furthermore, net exports can be negative in the case of a negative trade balance (when $I > X$, i.e. a country spends more on imports than it earns from exports).

4.

Al’s Shoeshine Stand	Last year (base year)	This year
Pairs of shoes shined	1,000	1,200
Price per shine	\$4	\$5
Nominal GDP (NGDP)	$1,000 \times \$4 = \$4,000$	$1,200 \times \$5 = \$6,000$
Real GDP (RGDP)	$1,000 \times \$4 = \$4,000$ (=NGDP)	$1,200 \times \$4 = \$4,800$

- When trying to measure the change in Al’s productivity over the past year it is better to use Real GDP, because when the price remains unchanged, we get a clearer perspective of the change in number of pairs shined.

5. Real GDP per person is not a really good measure of economic well-being, because not every good is bought and sold in a market. Furthermore, real GDP per person fails to show the distribution of wealth among people. It also does not reflect the state of the environment, the rate of depletion of natural resources, etc.

Problems

1.

Geroge	Quantity	Price (in clams)	Total
Fish	300	1	$300 \times 1 +$
Wild geese	5	10	$5 \times 10 +$
Pays Jared for help	-	30	30
			= 380 clams

Javed	Quantity	Price (in clams)	Total
Bananas bunches	200	5	200×5
Sold banana trees	5	30	-
Note:	The trees sold to George are not included in our calculations, because they were not “produced” during the current year.		= 1,000 clams

→ $GDP = 380 + 1,000 = 1,380$ clams

2. a. This will increase Egypt’s GDP by \$ 1 billion, because salaries paid to government workers are a part of government spending, which is a component of expenditure.

b. GDP remains unchanged, since transfer payments, such as pensions, do not come in exchange for any goods or services, and are not a part of expenditure.

c. Same as a. Egypt’s GDP will increase by \$ 1 billion, because salaries paid to government workers are a part of government spending, which is a component of expenditure.

d. Same as b. Interest payments are a type of transfer payment, which does not receive a good or service in return, and is not counted as part of expenditure.

e. This will decrease Egypt’s GDP by \$ 1 billion, since the oil is imported from Saudi Arabia, and must be subtracted from exports when calculating the net exports component of expenditure.

3.

	Product	Quantity	Price (apiece)	Sells for	Value added
Intelligence Incorporated	Chips	100	\$200	\$20,000	\$20,000
Bell Computers + Macrosoft	PC Software	100 100	\$800 \$50	\$80,000 + \$5,000	\$85,000 – \$20,000 = \$65,000
PC Charlie	PC (sells to public)	100	\$1,000	\$100,000	\$100,000 – \$85,000 = \$15,000
Value added approach	\$20,000 + \$65,000 + \$15,000 = \$100,000				
Market Value method	100 × \$1,000 = \$100,000				

4. a.

Company	Revenues	Cost	Value added
MNLogs	\$1,500	-	\$1,500
MNLumber	\$4,000	\$1,500	\$4,000 - \$1,500 = \$2,500
MNFurniture	100 × \$70 = \$7,000	\$4,000	\$7,000 - \$4,000 = \$3,000

b. GDP in 2007 increases by: $100 \times \$70 = \$1,500 + \$2,500 + \$3,000 = \$7,000$

c. In 2007 there is no change in GDP, because lumber is an intermediate good, used to produce tables. In 2008, when the tables were sold GDP increased by their market value, equal to \$7,000.

5. a. This purchase contributes to Turkey’s GDP, since the producer is Turkish. We have a case of Consumption, because the buyer is also Turkish.

b. The purchase has a negative effect on Turkey’s GDP, because the car is import. It has to be subtracted from the country’s Net exports, thus reducing the final value. The transaction falls into the Net exports category.

c. Just like in a, this purchase has a positive effect on GDP, since it was made in favor of the local producer. This time, however, it is counted as part of the Investment component of expenditure, since the car was purchased by a firm. More precisely, it falls into the Business fixed investment category.

d. Same case as b) (Might be counted as business fixed investment as well, since it is a purchase by a firm of a new capital good.)

e. This transaction increases Turkey's GDP since the producer of the car is Turkish. It falls into the Government purchases category, because the car is bought for a government employee.

6. $GDP = \text{Consumption expenditures} + \text{Exports} - \text{Imports} + \text{Gvt. Purchases} + \text{Construction of new homes} + \text{End-of-year inventory} + \text{Household purchases} = \$600 + \$75 - \$50 + \$200 + \$100 + \$125 + \$100 + \$150 = \$1,100$

Sales of existing homes is not included, because the homes were not produced during the current year. Government payments to retirees are not included either, because they are transfer payments and do not come in exchange for any goods or services. Beginning-of-year inventory stock is not included either, because it refers to goods produced by the firm during the previous year, which were not sold and were thus repurchased by the firm to sell during the following year.

7.

Year		
2000	Nominal GDP	$100 \times \$5 + 300 \times \$20 + 100 \times \$20 = \$8,500$
	Real GDP	$100 \times \$5 + 300 \times \$20 + 100 \times \$20 = \$8,500$
	GDP deflator	$(NGDP_{2000} \div RGDP_{2000}) \times 100 = 100$
2007	Nominal GDP	$125 \times \$7 + 250 \times \$20 + 110 \times \$25 = \$8,625$
	Real GDP	$125 \times \$5 + 250 \times \$20 + 110 \times \$20 = \$7,825$
	GDP deflator	$(NGDP_{2007} \div RGDP_{2007}) \times 100 = 110.22$
Inflation rate ₀₀₋₀₇	$(CPI_{07} - CPI_{00}) \div CPI_{00}$ We take 2000 as the base year, so it's CPI (consumer price index) equals 1. For 2007's CPI we need to find total spending on goods in 2000 in terms of 2007 prices, and divide it by the quantity consumed in 2000 in terms of 2000 prices. $CPI_{07} = (100 \times \$7 + 300 \times \$20 + 100 \times \$25) \div (100 \times \$5 + 300 \times \$20 + 100 \times \$20) = \$9,200 \div \$8,500 = 1.082$	

$$\rightarrow (CPI_{07} - CPI_{00}) \div CPI_{00} = (1.082 - 1) \div 1 = 0.082$$

$$\text{Inflation rate}_{00-07} = 8.2\%$$

8. Such a policy restricts the use of dirty fuels, which will cause the output of industries using dirty fuels to go down. Lower output levels will cause GDP to go down too. However, the implemented changes will lead to an improvement in air quality, which is not counted in GDP. In the long run, industries might transition to a substitute using cleaner technology. This will lead to higher output and GDP, and to a cleaner production process.

9. a) I would expect Denmark, the country with the highest GDP, to have the highest enrollment rate, and Ethiopia, the one with the lowest GDP, to have the lowest enrollment rate. This is so, because GDP is an indicator of the economic well-being of a country. Enrollment rates are expected to be higher in countries where people are better off financially, and have the capital means to send their children to school.

b) Other factors besides GDP per capita in this case might be the availability of schools in a given area, the available transportation to the school, and the fact that a child might be used as workforce instead of being sent to school. Chapter 13 – Public Goods and Tax Policy

Chapter 15: Inflation and the Price Level

Review Questions

1. Changes in the cost of living of any particular individual or family may differ from changes in the official cost-of-living index, the CPI, because what the CPI measures is the cost of living of a “typical” family, but not every family lies within the range of what “typical” represents in terms of purchasing power, spending habits and personal tastes.

2. The price level is the overall level of prices at a particular point in time, whereas the rate of inflation shows the annual rate of change in the price level. Both are measured in terms of a price index, such as the CPI.

3. This is so, because when comparing we are looking for a change in actual purchasing power. This can only be done when nominal quantities are converted into real quantities, i.e. when inflation is taken under consideration. The basic method to use when adjusting for inflation is to divide the nominal quantity by a price index (the CPI) in order to express it in real terms. This is also called deflating the quantity.

4. Indexation might be used to guarantee that the purchasing power of the wage agreed upon in a multilayer labor contract remains the same, because with indexation the dollar benefit is increased each year by the percentage change in the CPI. The way the wage keeps up with the change in actual purchasing power.

5. The official rate of inflation might understate the true rate of inflation, because:

- Firstly, the CPI fails to measure the change in quality of a good or service. If, for example, the quality of a certain good or service worsened, people will now be paying the same for a lower-quality product. Thus, the cost of this product has increased by more than what is showed by inflation. This is called the quality-adjustment bias.
 - The second reason why the official rate of inflation might understate the true rate of inflation is that the CPI accounts for a fixed basket of good and services, which are thought to represent the consumption of an average household, and does not show changes in that basket over the course of the year. So if people are indifferent between coffee and tea and the course of the year the price of tea significantly decreases, the fact that people now consume more of the cheaper tea and less of the more expensive coffee will not be reflected in the CPI. The fact that the CPI omits changes in the basket's contents means that inflation will seem higher than what it actually is. This is called the substitution bias.
 - Another thing is that not everyone falls into the "average family" category, which the CPI takes under consideration. That is, if you consume more expensive good than the average household, a higher rate of inflation will raise your expenses by a bigger amount.
- 6.** This is true only if we look at society as a whole, because what one group loses, in this case creditors, the other – debtors, gains. There are no "leaks", so to speak. (If looked at more deeply, if unexpected inflation occurs too often, people will be less motivate to lend money, which will have a negative effect on the economy as a whole)
- 7.** $r = i - \pi$ (Fischer equation) For the equation to hold, as inflation goes up the real return on holding cash goes down.
- 8.** Yes, because expected inflation can be built into the nominal interest rate set for the loan.

Problems

1. a. → Year 1 (base year):

$$\text{Total spending} = (20 \times \$10 + \$600 + \$100 + \$50) \times 12 = \$950 \times 12 = \$11,400$$

(Note: We multiply by 12, because we want to find the total amount spent for the whole year, and the quantities we are given refer to monthly consumption)

CPI = 1 (since it's the base year)

→ Year 2:

$$\text{Total spending} = (20 \times \$11 + \$640 + \$120 + \$40) \times 12 = \$1,020 \times 12 = \$12,240$$

$$\text{CPI} = \frac{\text{Total spending}_{\text{year 2}}}{\text{Total spending}_{\text{year 1}}} = \frac{\$12,240}{\$11,400} = 1.074$$

$$\begin{aligned} \rightarrow \text{Inflation rate}_{\text{year 1-year 2}} &= \frac{(\text{CPI}_{\text{Year 2}} - \text{CPI}_{\text{year 1}})}{\text{CPI}_{\text{year 1}}} = \frac{(1.074 - 1)}{1} = 0.074 \div 1 \\ &= 0.074 \qquad \qquad \qquad \text{Inflation rate}_{\text{year 1-year 2}} = 7.4\% \end{aligned}$$

b. The family is worse off, because even though their income rose by 5%, the overall level of prices increased by 7.4%.

2.

$$\text{Inflation rate}_{90-91} = (\text{CPI}_{1991} - \text{CPI}_{1990}) \div \text{CPI}_{1990} = (136.2 - 130.7) \div 130.7 = 5.5 \div 130.7 = 0.042 = 4.2\%$$

$$\text{Inflation rate}_{91-92} = (\text{CPI}_{1992} - \text{CPI}_{1991}) \div \text{CPI}_{1991} = (140.3 - 136.2) \div 136.2 = 4.1 \div 136.2 = 0.03 = 3\%$$

$$\text{Inflation rate}_{92-93} = (\text{CPI}_{1993} - \text{CPI}_{1992}) \div \text{CPI}_{1992} = (144.5 - 140.3) \div 140.3 = 4.2 \div 140.3 = 0.0299 = 2.99\%$$

$$\text{Inflation rate}_{93-94} = (\text{CPI}_{1994} - \text{CPI}_{1993}) \div \text{CPI}_{1993} = (148.2 - 144.5) \div 144.5 = 3.7 \div 144.5 = 0.026 = 2.6\%$$

$$\text{Inflation rate}_{94-95} = (\text{CPI}_{1995} - \text{CPI}_{1994}) \div \text{CPI}_{1994} = (152.4 - 148.2) \div 148.2 = 4.2 \div 148.2 = 0.0283 = 2.83\%$$

$$\text{Inflation rate}_{95-96} = (\text{CPI}_{1996} - \text{CPI}_{1995}) \div \text{CPI}_{1995} = (156.9 - 152.4) \div 152.4 = 4.5 \div 152.4 = 0.0295 = 2.95\%$$

$$\text{Inflation rate}_{96-97} = (\text{CPI}_{1997} - \text{CPI}_{1996}) \div \text{CPI}_{1996} = (160.5 - 156.9) \div 156.9 = 3.6 \div 156.9 = 0.0229 = 2.3\%$$

$$\text{Inflation rate}_{97-98} = (\text{CPI}_{1998} - \text{CPI}_{1997}) \div \text{CPI}_{1997} = (163 - 160.5) \div 160.5 = 2.5 \div 160.5 = 0.01557 = 1.56\%$$

$$\text{Inflation rate}_{98-99} = (\text{CPI}_{1999} - \text{CPI}_{1998}) \div \text{CPI}_{1998} = (166.6 - 163) \div 163 = 3.6 \div 163 = 0.022 = 2.2\%$$

$$\text{Inflation rate}_{99-00} = (\text{CPI}_{2000} - \text{CPI}_{1999}) \div \text{CPI}_{1999} = (172.2 - 166.6) \div 166.6 = 5.6 \div 166.6 = 0.0336 = 3.4\%$$

→ The rate of inflation fluctuates up and down in the period between 1990 and 2000. It falls in 1991, between 1992 and 1996 it remains relatively stable, then it falls again in 1997 and 1998, and it rises in 1999 and 2000.

3.

Year	Wage	% change in wage	CPI	Inflation rate (% change in CPI)	Change in purchasing power
1980	\$24.332	-	82.4	-	-
1985	\$32.777	34.71%	107.6	30.58%	Increases by 4.13%

1990	\$41.451	24.46%	130.7	21.46%	Increases by 3%
2000	\$62.228	50.12%	172.2	31.75%	Increases by 18.37%

→ If the inflation rate is overstated, then the change in purchasing power will be lower than what it appears to be based in the given data.

4.

Year	Real wage	Nominal wage	CPI
1990	A	?	130.7 (1.307 in order to use in calculations)
1997	$A \times 0.92$	\$13.65	160.5 (1.605 in order to use in calculations)

$$\text{Real wage}_{1997} = \text{Nominal wage}_{1997} \div \text{CPI}_{1997} = \$13.65 \div 1.605 = \$8.50 = A \times 0.92$$

$$\text{Real wage}_{1990} = A = \$8.50 \div 0.92 = \$9.24$$

$$\text{Nominal wage}_{1990} = \text{Real wage}_{1990} \times \text{CPI}_{1990} = \$9.24 \times 1.307 = \$12.08$$

$$\text{Nominal wage}_{1990} = \$12.08$$

5. If we want to prevent people from falling into higher tax brackets in 2010 because of inflation, we need to index the nominal wages in 2008 by the rate of change in the CPI between 2008 and 2010.

$$\text{Change in CPI (Inflation)}_{2008-2010} = (\text{CPI}_{2010} - \text{CPI}_{2008}) \div \text{CPI}_{2008} = (1.85 - 1.75) \div 1.75 = 0.0571$$

$$\rightarrow \text{Rate of inflation}_{2008-2010} = 5.71\%$$

Tax schedule ₂₀₀₈ × 1.0571 = Tax schedule ₂₀₁₀	Taxes due (percent of income)
$\$20,000 \times 1.0571 = \$21,142$	10
$(\$20,001 \times 1.0571) - (\$30,000 \times 1.0571) = \$21,143 - \$31,713$	12
$(\$30,001 \times 1.0571) - (\$50,000 \times 1.0571) = \$31,714 -$	15

\$52,855	
$(\$50,001 \times 1.0571) - (\$80,000 \times 1.0571) = \$52,856 - \$84,568$	20
$> \$80,000 \times 1.0571 = > \$84,568$	25

6.

Product	Year			Year		
	2008			2009		
	Quantity	Price	Total cost	Quantity	Price	Total cost
Chicken	30	\$3	= \$230	30	\$5	= \$300
Clams	10	\$6		10	\$7	
Steaks	10	\$8		10	\$8	

a. $CPI_{2008} = 1$

$$CPI_{2009} = \text{Total cost}_{2009} \div \text{Total cost}_{2008} = \$300 \div \$230 = 1.304$$

$$\text{Inflation rate}_{2008-2009} = (CPI_{2009} - CPI_{2008}) \div CPI_{2008} = (1.304 - 1) \div 1 = 0.304 = 30.4\%$$

b. Since people are indifferent between two chickens and one clam, in 2009, when two chickens cost \$10, and a clam is \$7, they would choose to consume more clam instead of buying chicken. Instead of buying 30 chickens, they would buy 15 additional clams for a total of \$105. This way their 2009 consumption basket would amount to \$255, and not \$300, as measured by the CPI. The substitution bias is equal to \$45.

7. Change in price_{year n–year (n+1)} = $(\text{Price}_{\text{year (n+1)}} - \text{Price}_{\text{year n}}) \div \text{Price}_{\text{year n}}$

$$\text{Change in CPI (Inflation)}_{\text{year n–year (n+1)}} = (CPI_{\text{year (n+1)}} - CPI_{\text{year n}}) \div CPI_{\text{year n}}$$

Year	Change in price	Change in CPI (Inflation)
1978-79	0.359 = 35.9%	0.113 = 11.3%
1979-80	0.408 = 40.8%	0.135 = 13.5%
1980-81	0.096 = 9.6%	0.103 = 10.3%
1981-82	-0.059 = -5.9%	0.061 = 6.1%

1982-83	-0.024 = -2.4%	0.032 = 3.2%
1983-84	-0.038 = -3.8%	0.043 = 4.3%
1984-85	0.0098 = 0.98%	0.036 = 3.6%
1985-86	-0.23 = -23%	0.056 = 5.6%

→ As we can see, the change in price and change in CPI do not go together, so we can conclude that most of the changes in gas prices were due to factors specific to the oil market.

8. a. cost of holding an average of \$15,000 in cash at a 5% inflation rate = $\$15,000 \times 0.05 = \750

If he goes to the bank every day with an average cash holding of \$5,000 and a rate of inflation of 5% = \$250

→ \$500 benefit of going to the bank each day

Cost of going to the bank = \$800 (given in the problem) → Since the cost outweighs the benefit, he won't go to the bank as often.

b. Cost of holding an average of \$15,000 in cash at a 5% inflation rate = $\$15,000 \times 0.05 = \750

If he goes to the bank every day with an average cash holding of \$5,000 and a rate of inflation of 5% = \$250

→ \$500 benefit of going to the bank each day

Cost of going to the bank = \$400 (goes from \$4 to \$2 per week) → Since the benefit outweighs the cost, he will go to the bank more often.

c. Cost of holding an average of \$30,000 (he now needs \$10,000 instead of \$5,000 per day) in cash at a 10% inflation rate = $\$30,000 \times 0.10 = \$3,000$

If he goes to the bank every day with an average cash holding of \$10,000 and a rate of inflation of 10% = \$1,000

→ \$2,000 benefit of going to the bank each day

Cost of going to the bank = \$800 (given in the problem) → Since the benefit outweighs the cost, he will go to the bank more often.

9. on next page

9. Keep in mind: $r = i - \pi$ (we have that $i = 6\%$)

Year	Inflation rate (π)	$r = i - \pi$	Real return
2010	$(105 - 100) \div 100 = 0.05 = 5\%$	$r = 6\% - 5\% = 1\%$	$\$1,000 \times 1.01 = \$1,010$ (return = \$10)
2011	$(110 - 105) \div 105 = 0.048 = 4.8\%$	$r = 6\% - 4.8\% = 1.2\%$	$\$1,010 \times 1.012 = \$1,022.12$ (return = \$12.12)
2012	$(118 - 110) \div 110 = 0.073 = 7.3\%$	$r = 6\% - 7.3\% = -1.3\%$	$\$1,022.12 \times 0.987 = \$1,008.32$ (return = -\$13.8)
			Total real return = \$8.32

10. $r = 2\%$

.) $CPI_n = 100$ expected: $CPI_{n+1} = 110$ $CPI_{n+2} = 121$

Inflation $_{n-(n+1)} = (110 - 100) \div 100 = 0.10 = 10\%$

Inflation $_{(n+1)-(n+2)} = (121 - 110) \div 110 = 0.10 = 10\%$

$\rightarrow r = i - \pi$; $r = 2\%$, $\pi = 10\% \rightarrow i = 12\%$ (the nominal interest rate)

b. The payments should be set at a real interest rate of $i = 2\% + \pi$ per year.

Chapter 16: Wages and Unemployment

Review Questions

1. For Samad Corporation to hire me the \$40,000 I am willing to work for should be less than my value of marginal product of labor – my marginal product (what I add to the firm's total production) times the price of the firm's output.

2. Two major factors contributing to increased wage inequality are globalization and technological advances. In the case of globalization, international trade may lower the wages of those who are already poorly paid and increase the wages of those who are already well paid. A way for policy makers to address this is by providing transition aid, which will increase worker mobility, i.e. the movement of workers between jobs, firms and industries. Technological advances may result biased toward more highly-skilled or educated workers, and can render the skills of some invaluable. In this case transitional aid and training is also a helpful tool.

3. Not necessarily, because the participation rate shows the fraction of the population that is either working or looking for work, meaning that a lot of people in the category might be looking for work, i.e. they might be unemployed.

4. The costs of a high unemployment rate can be economic psychological and social. From an economic perspective the main cost is the output that is lost because the workforce is not fully utilized. Providing more generous government aid might aggravate the problem, because it allows the unemployed to search longer and less-intensely for a new job.

5. Unemployment can be frictional, structural or cyclical. Frictional unemployment comes as a result of the process of matching workers with jobs. Structural unemployment is associated with long-term chronic unemployment, caused by lack or mismatch of skills. Cyclical unemployment has to do with business cycles and the extra unemployment that occurs over periods of recession, i.e. over periods of unusually low production. The least economically and socially costly one is frictional unemployment. In fact, it can even be beneficial, since it is associated with matching a worker with the most suitable job possible.

Problems

1. a.

Number of workers	Marginal Product of Labor (MPL)	Value of Marginal Product of Labor (VMPL = MPL × Price)
1	10	$(\$130 - \$100) \times 10 = \$30 \times 10 = \300
2	8	$(\$130 - \$100) \times 8 = \$30 \times 8 = \240
3	6	$(\$130 - \$100) \times 6 = \$30 \times 6 = \180
4	4	$(\$130 - \$100) \times 4 = \$30 \times 4 = \120
5	2	$(\$130 - \$100) \times 2 = \$30 \times 2 = \60

b.

Number of workers	Bikes per day	MPL	VMPL
1	10	10	$(\$130 - \$100) \times 10 = \$30 \times 10 = \300
2	18	8	$(\$130 - \$100) \times 8 = \$30 \times 8 = \240
3	24	6	$(\$130 - \$100) \times 6 = \$30 \times 6 = \180
4	28	4	$(\$130 - \$100) \times 4 = \$30 \times 4 = \120
5	30	2	$(\$130 - \$100) \times 2 = \$30 \times 2 = \60

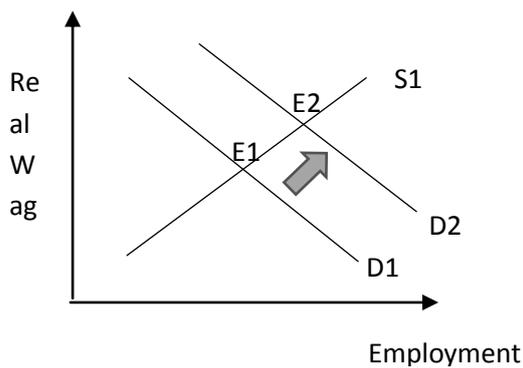
c.

Number of workers	Bikes per day	MPL	VMPL
1	10	10	$(\$140 - \$100) \times 10 = \$40 \times 10 = \400
2	18	8	$(\$140 - \$100) \times 8 = \$40 \times 8 = \320
3	24	6	$(\$140 - \$100) \times 6 = \$40 \times 6 = \240
4	28	4	$(\$140 - \$100) \times 4 = \$40 \times 4 = \160
5	30	2	$(\$140 - \$100) \times 2 = \$40 \times 2 = \80

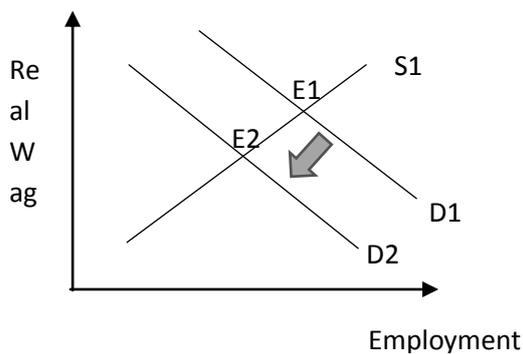
d.

Number of workers	Bikes per day	MPL	VMPL
1	15	15	$(\$130 - \$100) \times 15 = \$30 \times 15 = \450
2	27	12	$(\$130 - \$100) \times 12 = \$30 \times 12 = \360
3	36	9	$(\$130 - \$100) \times 9 = \$30 \times 9 = \270
4	42	6	$(\$130 - \$100) \times 6 = \$30 \times 6 = \180
5	45	3	$(\$130 - \$100) \times 3 = \$30 \times 3 = \90

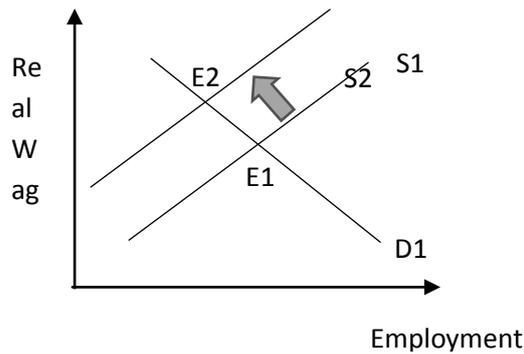
2.



.) An increase in demand will make production more valuable, so the firm will hire more workers at any given wage. The demand curve will shift to the right. Both equilibrium wage and quantity will increase.



b. The product will become less valuable. The opposite of a) will occur. Both equilibrium price and quantity will decrease.



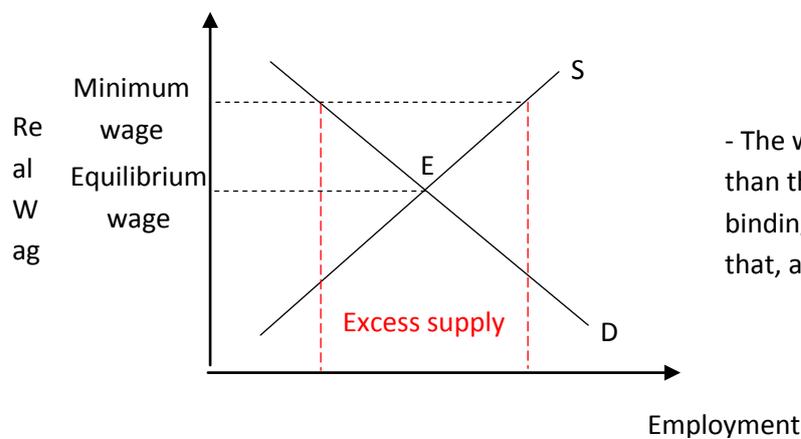
c. Supply of labor will decrease, so the supply curve will shift to the left. Equilibrium wage will increase and equilibrium quantity will decrease.

d. Productivity will increase, so labor will become more valuable and the demand for it will increase. Both equilibrium wage and quantity will increase. (graph like case a)

e. The demand for labor will decrease, because low-skilled labor will be replaced by machines. Both equilibrium wage and equilibrium quantity will decrease. (graph like case b)

f. The workers might require better working conditions. If the costs of implementing these changes are lower than the benefits, then this will be beneficial for the firm, because it might increase productivity. From there, the demand for labor will increase, and both equilibrium wage and quantity will increase. (graph like case a)

- If the costs are higher than the benefits, the opposite will happen. (graph like case b)



- The workers might require a minimum wage, higher than the market-clearing wage, which will result in a binding price floor and excess labor supply, which means that, as a result, some workers will be left unemployed.

3. a. Supply will increase, because people who were about to leave the labor market will be forced to stay.

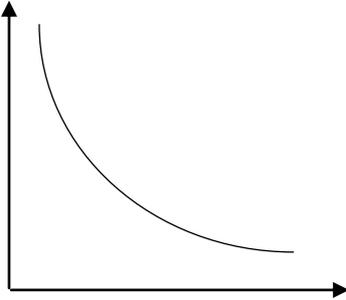
b. The increase in productivity and consequently in wages, will raise the demand for labor, so the labor demand curve will shift to the right. However, labor supply remains unchanged, as we only move along the labor supply curve (See figure 16.5 on page 475).

c. Supply will decrease.

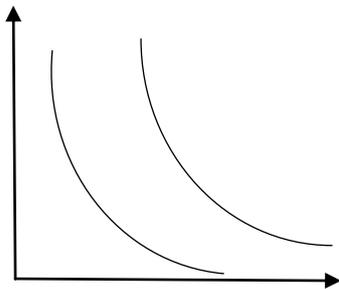
d. In the short run supply will decrease, due to people taking maternity or paternity leave. In the long run, however, a population increase will lead to a labor supply increase.

e. Higher pension benefits will serve as an incentive for people to retire earlier and for retired people to stop working (if they were trying to earn some extra cash by doing so), thus overall labor supply will decrease.

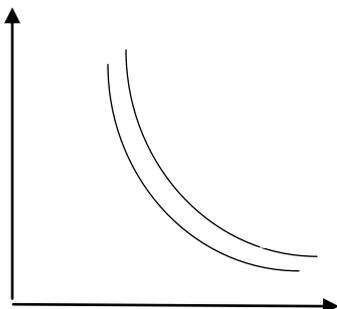
4.



a) Since the marginal product of labor (MPL) of skilled workers increases, they become more valuable to the firm, which is now willing to hire more of them at any given price. The demand and wage for skilled workers increases. The opposite will happen to less skilled labor. Since their MPL remains unchanged, the firm is willing to hire less. What adds to this is the fact that now it is spending more on high-skilled labor. Wage and demand for low-skilled labor will decrease.



b) The supply of unskilled labor will decrease with the transfer of workers from unskilled to skilled. This way the supply of skilled labor will increase, which will gradually lower the wage gap between the two groups of workers.



5.

Total number of people:	65
Employed:	25 + 5 = 30 (full-time jobs; part-time jobs)
Unemployed:	2 (would like a job & actively looking for one)
Out of the labor force:	10 + 10 + 5 + 5 + 2 + 1 = 33 (children; under 16; retired; full-time homemakers; full-time students over 16; disabled people; would like a job, but not actively looking for one)

6.

Participation rate = 62.5% = Labor force ÷ Working-age population

Labor force = Employed + Unemployed = L

Working-age population = Employed + Unemployed + Out of the labor force = L + 60m

$$\rightarrow 0.625 = L \div (L + 60m)$$

$$L = 0.625L + 0.625 \times 60m$$

$$0.375L = 37.5m$$

$$L = 100m = \text{Employed} + \text{Unemployed}$$

Unemployment rate = 5% = Number of unemployed ÷ Labor force

$$\rightarrow 0.05 = \text{Unemployed} \div 100m$$

$$\text{Unemployed} = 0.05 \times 100m = 5m$$

$$\rightarrow \text{Employed} = \text{Labor force} - \text{Unemployed} = 100m - 5m = 95m$$

$$\text{Employed} = 95 \text{ million}$$

7. a. This is a case of structural unemployment, because his lack of skills for other industries is what prevents him from finding a job (case of long-term mismatch).

b. This is cyclical unemployment, which is the extra unemployment that results in periods when the economy or industry is performing poorly.

- c. This is cyclical unemployment, because it is related to the business cycles of the local moving companies.
- d. This is frictional unemployment, associated with the process of matching worker and job.
- e. As in d, this is a case of frictional unemployment.
- f. This is a case of frictional unemployment. If it was explicitly stated that the company went bankrupt because of economic problems in the sector, we would be able to say that there is also cyclical unemployment involved.

Chapter 17: Economic growth

Review questions

1. Over the past century real GDP per person has substantially increased, meaning that the average person can now afford more goods and services, and the standard of living has increased as well. Yes, the implications are different for different countries, because growth rates are different in different countries.
2. Economists consider growth in average labor productivity to be the key in determining long-run living standards, because real GDP per person can grow only to the extent that there is growth in worker productivity and/ or in the fraction of the population that is employed.
3. Human capital is an amalgam of factors such as education, training, experience, intelligence, energy, work habits, etc. It is economically important, because it affects the value of a worker's marginal product. It can be created through education and on-the-job training.
4. I will assign shovels to the strongest workers, because they can use them to the fullest.
 - a. For a given number of workers every additional piece of physical capital, average labor productivity would also increase, unless:
 - b. The amount of labor employed remains constant. Then at some point the more capital that we add will result in lower and lower additional units of capital added to production, which is known as diminishing returns to capital.
5. Entrepreneurs introduce useful new products, practices and technologies. Managers allocate resources to their best use.
6. The government establishes property rights, enforces law, and ensures stability.
7. It is true that the resources we humans use are finite, so in this does impose limits on the extent of economic expansion. However economic growth does not only involve the use of natural resources. It also includes the developments of better, more efficient and environmentally friendly products and the development of alternative resources. Thus, we can conclude that the statement is not entirely true.

Problems

1.

	Richland	Poorland
RDGP per capita	\$10,000 (R_0)	\$5,000 (P_0)
Growth rate	1% (0.01) (g_R)	3% (0.03) (g_P)
After 10 years	$\$10,000 \times (1.01)^{10} = \$11,046$	$\$5,000 \times (1.03)^{10} = \$6,720$
After 20	$\$10,000 \times (1.01)^{20} = \$12,202$	$\$5,000 \times (1.03)^{20} = \$9,031$

To catch up:

$$R_{t+1} = R_0 \times (1 + g_R)^t$$

$$P_{t+1} = P_0 \times (1 + g_P)^t$$

We need them to be equal for them to have caught up

$$10,000 \times (1 + 0.01)^t = 5,000 \times (1 + 0.03)^t$$

$$2 \times (1 + 0.01)^t = (1 + 0.03)^t$$

$$\ln 2 + t \times \ln 1.01 = t \times \ln 1.03$$

$$\ln 2 = t \times (\ln 1.03 - \ln 1.01)$$

$$\ln 2 = t \times (\ln 1.03 \div \ln 1.01)$$

$$t = (\ln 1.03 \div \ln 1.01) \div \ln 2$$

t = 35 years (for Poorland to catch up with Richland)

2. n = 20 years

a. $\text{Productivity}_{2030} = \text{Productivity}_{2010} \times (1.031)^{20} \rightarrow$ it will be 1.84 times higher

b. $\text{Productivity}_{2030} = \text{Productivity}_{2010} \times (1.014)^{20} \rightarrow$ it will be 1.32 times higher

3.

	Y/N	N/POP
1960	\$44,216	36.4%
2006	\$88,204	48.1%
2052	$\$88,204 + (\$88,204 - \$44,216) = \$132,192$	36.4%

Net change in $RGDP_{\frac{p}{c}}$ between 2006 and 2052: $(RGDP_{\frac{p}{c}2052} - RGDP_{\frac{p}{c}2006}) \div RGDP_{\frac{p}{c}2006}$

$$RGDP_{\frac{p}{c}2006} = Y/POP = Y/N \times N/POP = \$88,204 \times 0.481 = \$42,426.12$$

$$RGDP_{\frac{p}{c}2052} = Y/POP = Y/N \times N/POP = \$132,192 \times 0.364 = \$48,117.89$$

→ Net change in $RGDP_{\frac{p}{c}}$ between 2006 and 2052 = $(\$48,117.89 - \$42,426.12) \div \$42,426.12 = 0.134$ 13.4%

4. a.

Germany	Y/POP	N/POP	Y/N (= Y/POP × N/POP)
1979	\$13,993	0.33	\$42,403.03
2008	\$20,801	0.48	\$43,335.42
Japan	Y/POP	N/POP	Y/N (= Y/POP × N/POP)
1979	\$13,163	0.48	\$27,422.92
2008	\$22,816	0.52	\$43,876.92

We know that $Y/POP = (Y/N) \times (N/POP)$

We can say that: $\% \Delta(Y/POP) \approx \% \Delta(Y/N) + \% \Delta(N/POP)$

To see how much the increase in output per person in each country is due to N/POP and Y/N we have to find the percentage changes in the two over time. When doing the calculations we see that for Germany the N/POP has a larger effect on GDP. In the case of Japan it's Y/N.

5.

	Go directly to work	First go to college
Earn	$\$20,000 \times 5$	$\$38,000 \times 3$
Borrow		$\$6,000 \times 2$
Living costs	$\$15,000 \times 5$	$\$15,000 \times 5$

a. $i = 0\%$

Final savings	$(\$20,000 - \$15,000) \times 5 =$ \$25,000	$\$38,000 \times 3 - \$6,000 \times 2 -$ $\$15,000 \times 5 = \$27,000$
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→ She will choose to first go to college.

b. wage with just high school diploma = \$ 23,000

Final savings = $(\$23,000 - \$15,000) \times 5 = \$40,000$

→ She will choose to directly start working.

c. she now has to borrow \$8,000 instead of \$6,000 $\$38,000 \times 3 - \$8,000 \times 2 - \$15,000 \times 5 =$
\$27,000

Final savings = $\$38,000 \times 3 - \$8,000 \times 2 - \$15,000 \times 5 = \$25,000$

→ Now she will be indifferent between directly starting to work and going to college.

d. $i = 10\%$

Starts working straight off

Year 1	\$5,000
Year 2	$(\$5,000) \times 1.1 + \$5,000 = \$10,500$
Year 3	$(\$10,500) \times 1.1 + \$5,000 = \$16,550$
Year 4	$(\$16,550) \times 1.1 + \$5,000 = \$23,205$
Year 5	$(\$23,205) \times 1.1 + \$5,000 = \$30,525.5$

First goes to college

Year 1	$-\$6,000 - \$15,000 = -\$21,000$
Year 2	$(-\$21,000) \times 1.1 - \$6,000 - \$15,000 = -\$44,100$
Year 3	$(-\$44,100) \times 1.1 - \$15,000 + \$38,000 = -\$25,510$
Year 4	$(-\$25,510) \times 1.1 - \$15,000 + \$38,000 = -\$5,061$
Year 5	$(-\$5,061) \times 1.1 - \$15,000 + \$38,000 = \$17,432.9$

→ She would choose to start working without going to college.

6. a. – total output: $40 \times 2 = 80$ customers/hour

- average labor productivity: $80 \div 4 = 20$ c/h

b. – total output: $40 + 25 + 25 = 90$ c/h

- average labor productivity: $90 \div 4 = 22.5 \text{ c/h}$

c. – total output: $25 + 25 + 25 + 25 = 100 \text{ c/h}$

- average labor productivity: $100 \div 4 = 25 \text{ c/h}$

d. – total output: $25 + 25 + 25 + 25 + 0 = 100 \text{ c/h}$

- average labor productivity: $100 \div 4 = 25 \text{ c/h}$

→ Yes, there are diminishing returns to capital, because when we add the fifth checkout lane, output and productivity remain the same.

7. a. average labor productivity: $(100 + 100 + 80) \div 3 = 93.33 \text{ ft}^2/\text{h}$

b. 1 roller average labor productivity: $(100 + 100 + 200) \div 3 = 133.33 \text{ ft}^2/\text{h}$

2 rollers average labor productivity: $(100 + 200 + 200) \div 3 = 166.67 \text{ ft}^2/\text{h}$

3 rollers average labor productivity: $(200 + 200 + 200) \div 3 = 200 \text{ ft}^2/\text{h}$

4 rollers average labor productivity: $(200 + 200 + 200) \div 3 = 200 \text{ ft}^2/\text{h}$

→ Yes, there are diminishing returns to capital.

c. → There are still diminishing returns to capital. The improvement increases the economic value of an additional roller, because now an additional roller makes the area painted by worker per hour greater.

8. a. Hayat will maximize the growth of her stock of fish from this season to the next if she harvests no fish and leaves all 1,000 of them to reproduce. This way, she will have 2,000 with the growth rate being 100%.

b. Maximizing the growth of her fish stock is not an economically sound decision. If she sells no fish, she will have no current income to get by with, which makes little sense and is not really feasible.

a. If Hayat wants to maximize her current income she should harvest no fish and sell all of them instead. This way, her current income will be equal to \$5,000, since a fish sells for \$5 apiece.

d. It is more likely that Hayat will harvest some fish and leave some to reproduce. This way she will be both providing herself with a current income and investing in her future.

9. The statement is true because if economic conditions are not favorable, people will not be able to finance, further develop and introduce their discoveries to the market. A fairly recent example, shows that economic conditions can hinder the development of a discovery (in this case service) which benefits society. That is the withdrawal of Uber from Sofia. Our legislature banned the service due to competition concerns under the pretext that it was hurting local taxi businesses. This way a cheaper and more efficient means of transportation was prevented from developing here because it was hurting the business of those who have a monopoly over the market.

Chapter 18: Saving, Capital Formation and Financial Markets

Review questions

1. Saving is current income minus spending on current needs. Wealth is the value of assets minus liabilities. Saving, being an example of a flow is defined per unit of time. Wealth is a stock, which is a measure defined at point in time. The flow of saving causes the stock of wealth to change at the same rate.

2. People might save to meet long-term objectives. This is called life-cycle saving. An example is saving for retirement or to buy a house. People might also save for protection against unexpected setbacks. This is called precautionary saving. The cause for precautionary saving might be the loss of a job or a medical emergency. Yet another reason why people might save is for the purpose of leaving an inheritance. This is called bequest saving. Its purpose might be to leave an inheritance for one's kids, or to donate to a charity.

3. $S = Y - C - G - Y - (C + G) = Y - (C + G)$

Y – production \Leftrightarrow current income

$C + G$ – spending on current needs

- This way it might be understated, sometimes when people save they deposit their money in pension funds where interest rates are compounded. So, the actual amount saved over time is larger than the amount initially deposited.

4. The fact that household saving rates declined in the US is the

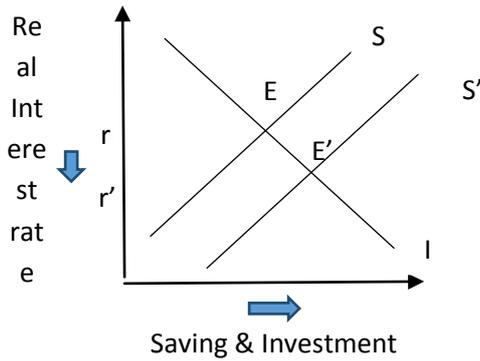
- availability of government assistance to the elderly
- purchasing a home has become more affordable
- people are more confident about the future
- borrowing has become easier

* as the economic crisis showed this can be a problem if people rely entirely on the government and banks and spend much more than they have and earn

5. Increases of interest rates reduce the quantity of saving demanded, because the higher the interest rates, the higher the cost of borrowing and the lower the demanders' willingness to invest. The demanders for saving are firms who want to invest and they need to borrow in financial markets.

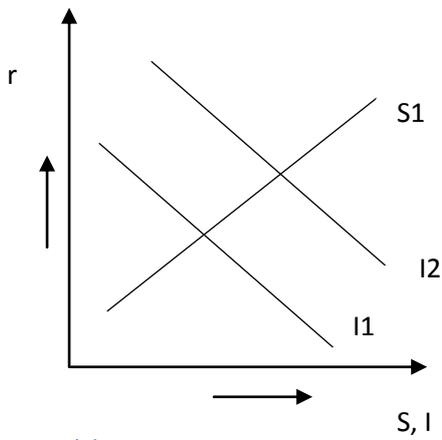
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→ affects supply of saving – a government budget surplus



Saving and investment will increase, and the interest rate will go down.

→ affects the demand for saving (= investment)



A corporate tax cut. Investment, quantity saved and the interest rate rise.

Problems

1. a.

Assets	Liabilities
Bike = \$300	Credit card debt = \$150
Cash = \$200	Electric bill = \$250
Rare coin = \$400	
Checking account = \$1,200	
	Net Worth = $A - L = \$1,700$

b. His assets go down by \$400, and his net worth now equals \$1,300.

c. His liabilities go down by \$150, so his net worth is now equal to \$1,850.

d. His assets go down by \$150, but his liabilities also go down by \$150, so his net worth remains unchanged.

→ c. counts as saving, because he uses part of his income to pay off his debt

2. a. GDP is a flow variable, because it is measured yearly, and is defined per unit of time.
- b. Just as GDP, national saving is measured per unit of time, and is thus a flow.
- c. The value of the housing stock is measured at a point in time and is a stock.
- d. The amount of currency in circulation as of this morning is measured at a point in time and is a stock.
- e. The government budget deficit, which is part of national saving, is a flow.
- d. The outstanding government debt is measured at a point in time, and is a stock.
3. a. The amount they save per month will increase due to life-cycle motives, i.e. they will have to take care of their child, pay for her/his education, etc.
- b. They will save more due for precautionary reasons.
- c. Since his parents won't be able to help buy the house, now Hassan and Huda will need to save more. We have a case of life-cycle saving.
- d. She will have to save more in order to pay her tuition. This is a case of life-cycle saving.
- e. Since they are now closer to their retirement target, they will now save less. This is a case of life-cycle saving.
- f. They will have to save more in order to leave more for their kids. This is a case of bequest saving.

4. a. If he deposits his money in an IRA for the five-year period before being taxed, Ghassan will earn the following amount: $\$10,000 \cdot (1 + 0.05)^5 = \$10,000 \cdot 1.2763 = \$12,762.82$

What he will be left with after being taxed at the end of the fifth year will be equal to: $\$12,762.82 \cdot (1 - 0.30) = \$12,762.82 \cdot 0.70 = \$8,933.97$

If he deposits his money in a normal account, he will first be taxed, so what he will be able to deposit is: $\$10,000 \cdot (1 - 0.30) = \$7,000$.

In five years, given that he will be taxed each year, his final return will be equal to: $\$7,000 \cdot [1 + 0.05(1 - 0.30)]^5 = \$7,000 \cdot 1.1877 = \$8,313.80$.

We can see that if Ghassan deposits his money in an IRA, he will have \$620.17 more than if he deposits his money in a normal account. Thus, an IRA is a good idea for Ghassan.

b. I do think that the availability of IRA's will increase the amount that households save, because this type of account allows you to lose a smaller amount of your return in the form of a tax. If the real interest rate increases, people will receive a higher return on their savings, so they will want to save more, because the benefit of saving will be higher.

5. a. HHsaving = 200

Bus. Saving = 400

G = 100

Gvt transfer payments = 100

Tax collections = 150

GDP = 2,200

- Saving private = HHs + Bus saving = 200 + 400 = 600

- T = Tax collect – Gvt transf paym = 150 – 100 = 50

- Saving public = T – G = 50 – 100 = -50 (deficit)

- S = S public + S private = -50 + 600 = 550

- National saving rate = 550 ÷ 2,200 = 0.25 (25%)

b. Y = 6,000

Taxes = 1,200

Gvt transfer & interest payments = 400

C = 4,500

Gvt budget surplus = 100

- T = Taxes – Gvt transf & interest payments = 1,200 – 400 = 800

- S public = Y – T – C = 6,000 – 800 – 4,500 = 700

- S = S public + S private = 100 + 700 = 800

- National saving rate = 800 ÷ 6,000 = 0.133 (13.3%)

c. C = 4,000

I = 1,000

G = 1,000

NX = 0

Taxes = 1,500

Gvt transf & int paym = 500

- $Y = C + I + G + NX = 4,000 + 1,000 + 1,000 + 0 = 6,000$

- $T = 1,500 - 500 = 1,000$

- $S_{\text{private}} = Y - T - C = 6,000 - 1,000 - 4,000 = 1,000$

- $S_{\text{public}} = T - G = 1,000 - 1,000$ (in balance)

- $S = S_{\text{private}} + S_{\text{public}} = 1,000 + 0 = 1,000$

- National saving rate = $1,000 \div 6,000 = 0.1666$ (16.7%)

6. a. Willing to pay \$1,500 per month $\times 12 = \$18,000$ per year if they rent

- if they buy:

$(\$200,000 \times 0.04) + (\$200,000 \times 0.06) = \$8,000 + \$12,000 = \$20,000$

→ $\$20,000 > \$18,000$ so they will prefer to rent

b. rent goes up to \$2,000 per month = \$24,000 per year → they will prefer to buy

c. if buy: $(\$200,000 \times 0.04) + (\$200,000 \times 0.04) = \$8,000 + \$8,000 = \$16,000$

→ will prefer to buy

d. if buy: $(\$150,000 \times 0.04) + (\$150,000 \times 0.06) = \$6,000 + \$9,000 = \$15,000$

→ will prefer to buy

e. Home-building companies dislike high interest rates, because the higher the interest rate, the higher the opportunity cost for people to borrow and build homes, so the less likely they are to do so.

7. a.

Number of screens	Number of patrons	VMP
1	40,000	$40,000 \times \$2 = \$80,000$
2	75,000	$35,000 \times \$2 = \$70,000$
3	105,000	$30,000 \times \$2 = \$60,000$

4	130,000	\$50,000
5	150,000	\$40,000

→ diminishing returns to product

b. $r = 0.055$

1st screen: cost = $\$1,000,000 \times 0.055 = \$55,000$

Profit = $\$80,000$

2nd screen: cost = $\$1,000,000 \times 0.055 = \$55,000$

Profit = $\$70,000$

3rd screen: cost = $\$1,000,000 \times 0.055 = \$55,000$

Profit = $\$60,000$

4th screen: cost = $\$1,000,000 \times 0.055 = \$55,000$

Profit = $\$50,000$

→ Will be willing to build 3 screens, because at 4th, the cost is greater than the profit

c. if $r = 0.075$ → cost per screen = $\$75,000$

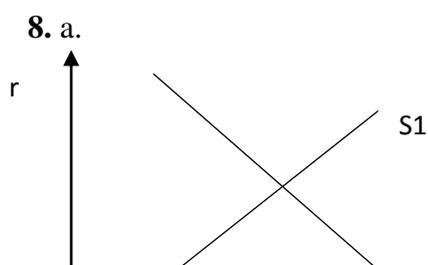
→ Will be willing to build 1 screen

d. if $r = 0.01$ → cost per screen = $\$100,000$

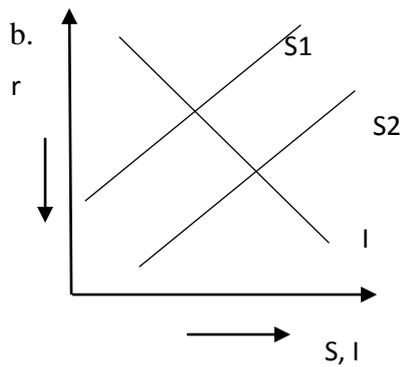
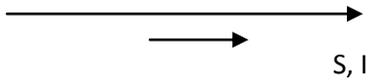
→ Will build no screens

e. $0.055 \times ? = \$40,000$

$? = \$727,272.73 =$ cost per screen if he wants to build all 5 screens

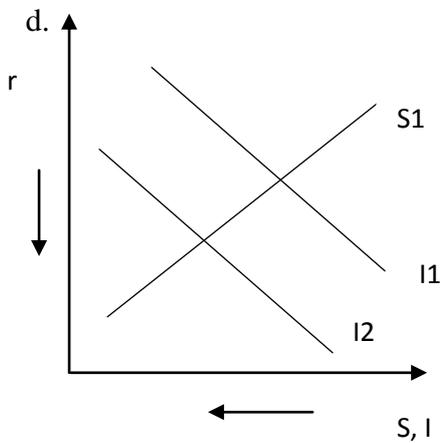


The tax cut will motivate firms to spend more which will increase investment. Investment, quantity saved and the interest rate rise.

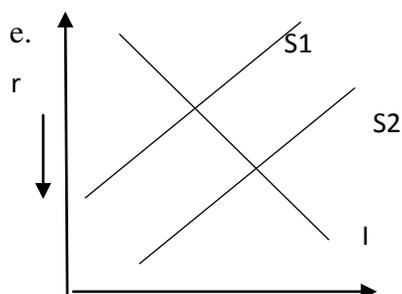


The decrease in the government budget deficit will lead to an increase in saving. Quantity invested will rise and the interest rate will fall.

c. Due to the technological improvement investment will increase. Same graph as a.



Firms will have a higher cost to invest, so investment will decrease. The quantity saved and the interest rate will also go down.



This will increase saving. The quantity invested will rise and the interest rate will go down.

f. This will raise the cost of investing. Same graph as d.

Chapter 19: The Financial System, Money and Prices

Review questions

1. This depends on his coupon rate and on the rate on newly issued bonds. If the new rate is higher, he will expect less than 1,000, if it is lower, he will expect more. This is so, because if new bonds pay a lower rate, people will be willing to pay more to buy a bond which pays a higher interest rate. The opposite will happen if new bonds have a higher interest rate.

2. Since the prices of bonds did not change, we can infer that the change did not come from a change in interest rates. It was brought about by a change which affects only the stock market and has not effect on the bonds market. For example there might be a change in expected future dividends or a change in the expected future price of the stock.

3. Financial markets provide information about possible investments which comes in handy when you have to decide what to invest in. For example, a bank will lend your money to a trustworthy borrower, and screening out one on your own takes time and resources. Mutual funds help diversify the ventures one invests in and shares the risks stock markets carry. This way instead of investing your money in just one firm or industry, you can invest in a diversified portfolio. Once again, doing this by yourself will be time consuming and costly.

4. Money is any asset that can be used in making purchases. People hold it (currency) even though it pays a lower return compared to other assets, because it is a universally accepted means of exchange that is its high liquidity makes it extremely easy to use when making transactions.

5. Using checks more means that people will have more deposits in the bank (because you write a check against your bank deposits). If the level of deposits goes up banks will start giving out more loans, which will again be re-deposited, so the rate of money creation will increase and the money supply will go up.

6. If the Fed wants to reduce the money supply, it will execute an open-market sale of government bonds to the public. The money people pay with is retired from circulation. This way the amount of money circulating in the economy goes down.

7. $M * V = P * Y$

Since V and Y are relatively constant, an increase in M will cause P to rise and, conversely, a rise in P will cause M to also rise, in order for the equation to hold. (This is why they are closely linked)

Problems

1. a. Principal amount = \$1,000

Coupon payment (per year) = \$60

Term = 3 years

Total coupon payments = \$180

Coupon rate = $\$60 \div \$1,000 = 0.06$ (6%)

b. new rate = 3%; can sell for: $\$1,060 \div 1.03 = \$1,029.13$

new rate = 8%; can sell for: $\$1,060 \div 1.08 = \981.48

new rate = 10%; can sell for: $\$1,060 \div 1.10 = \963.64

c. Even though rates have not changes, the price of bonds might go down because another assets has become more profitable. For example, a breakthrough technological discovery in an IT company will make a lot of people switch from bonds to stock (because that firm will be expected to have higher profits and pay higher dividend in the future), and the demand for bonds will decrease. With this, their price will also decrease.

2. Dividend in 1 year = \$5

Will be able to sell share for \$100

a. $r = 5\%$ / no risk

Price = $\$105 \div 1.05 = \100

b. $r = 10\%$ / no risk

Price = $\$105 \div 1.1 = \95.45

c. $r = 5\%$ & risk premium = 3%; actual rate = 8%

Price = $\$105 \div 1.08 = \97.22

d. is not expected to pay a dividend

- rate = 5%; price = $\$100 \div 1.05 = \95.24

- rate = 10%; price = $\$100 \div 1.10 = \90.91

- rate = 8%; price = $\$100 \div 1.08 = \92.59

3. a. Since new bonds offer a higher return, the value of the bonds you have will go down, so the value of your assets will go down.

b. If inflation is expected to fall, then the real interest rate will rise. This means that your bond will now offer a lower return compared to newly-issued bonds so its price, along with the overall value of your assets, will go down.

c. Since stocks are now more risky, they will become less desirable an asset and their prices will go down. The value of your assets decreases.

d. The announcement will make your stock a more desirable assets, so its price will go up. This will increase the value of your assets.

e. This will make the stock less desirable, so its price will go down. This will lower the value of your assets.

f. The higher government regulation will lead to lower profits for the company, so the demand for its stock and its price will go down. This will decrease the value of your assets.

4. a. They were a medium of exchange because prisoners used them to purchase goods and services, a unit of account because the prices of different goods and services were measured in terms of cigarettes, and a store of value because the amount of cigarettes a prisoner had determined his wealth.

b. They used cigarettes because they had a monthly inflow of them coming from the Red Cross.

c. Yes, he would be willing to accept cigarettes, because he would be able to use them in purchasing goods and services.

5. Initial

Assets	Liabilities
Reserves 5,000,000	Deposits 5,000,000

After one round of loans

Assets	Liabilities
Reserves 500,000	Deposits 5,000,000
Loans 4,500,000	

Loans are redeposited; second round of loans

Assets	Liabilities
--------	-------------

Reserves 950,000	Deposits 9,500,000
Loans 8,550,000	

Loans are redeposited; second round of loans

Assets	Liabilities
Reserves 1,805,000	Deposits 13,550,000
Loans 16,245,000	

Final (Deposits = $1/0.1 * 5,000,000$)

Assets	Liabilities
Reserves 5,000,000	Deposits 50,000,000
Loans 45,000,000	

b. Initial

Assets	Liabilities
Reserves 1,000,000	Deposits 1,000,000

One round of loans

Assets	Liabilities
Reserves 200,000	Deposits 1,000,000
Loans 800,000	

Loans are redeposited; second round of loans

Assets	Liabilities
Reserves 360,000	Deposits 1,800,000
Loans 1,440,000	

Loans are redeposited; third round of loans

Assets	Liabilities
Reserves 488,000	Deposits 2,440,000
Loans 1,952,000	
Assets	Liabilities
Reserves 590,400	Deposits 2,952,000
Loans 2,361,600	

Final (Deposits = $1/0.2 * 1,000,000$)

Assets	Liabilities
Reserves 1,000,000	Deposits 5,000,000
Loans 4,000,000	

6. a. Reserves = 100

Currency = 200

Reserves/Deposits = 25/100

Deposits = $(100 * 100) / 25 = 400$

Money supply = Currency + Deposits = 200 + 400 = 600

b. MS = 500 = Currency + Deposits

Currency = Reserves

Reserves/Deposits = 25/100 -> Reserves = 0.25 * Deposits = Currency

MS = 1.25 * Deposits -> Deposits = $500 / 1.25 = 400$

Currency = Reserves = $0.25 * 400 = 100$

c. MS = 1,250

Currency = 250

Deposits = $1,250 - 250 = 1,000$

Reserves = 100

Reserves/Deposits = $100 / 1,000 = 0.1$ -> 10%

7. a. The money multiplier is generally greater than one, because when deposits increase part of them is held as reserves, and the rest is given out as loans, which earn interest and are re-deposited in the bank. (The money multiplier is the inverse of the reserve/deposit ratio which is at most one, so it is always greater than one.)

b. $MS = 1,000$

Currency = 500

Deposits = $1,000 - 500 = 500$

Reserves/Deposits = $1/5 \rightarrow$ Reserves = $500/5 = 100$ (Deposits = Reserves*5)

- reserves = 101

Deposits = $101*5 = 505$ (go up by 5)

- reserves = 105

Deposits = $105*5 = 525$ (up by 25)

- reserves = 110

Deposits = $110*5 = 550$ (up by 50)

\rightarrow The money multiplier is 5

c., d) beyond the scope of the course

8. $RGDP = 8tr$; $NGDP = 1tr$

$M1 = 2tr$; $M2 = 5tr$

$M*V = P*Y$

$V = (P*Y) \div M = NGDP \div M$

$V1 = 10 \div M1 = 5$

$V2 = 10 \div M2 = 2$

$2*5 = 10$ and $5*2 = 10 \rightarrow$ holds in both cases

9. a. $M*V = P*Y \rightarrow P = (M*V) \div Y$

$P_{07} = (1,000*0.8) \div 12,000 = 0.067$

$P_{08} = (1,050*0.8) \div 12,000 = 0.07$

$Inflation_{07-08} = (0.07 - 0.067) \div 0.067 = 0.045 \rightarrow 4.5\%$

b. $M_{08} = 1,100$

$$P_{08} = (1,100 \cdot 0.8) \div 12,000 = 0.073$$

$$\text{Inflation}_{07-08} = (0.073 - 0.067) \div 0.067 = 0.0896 \rightarrow 8.96\%$$

c. $M_{08} = 1,100$

$$Y_{08} = 12,600$$

$$P_{08} = (1,100 \cdot 0.8) \div 12,600 = 0.0698$$

$$\text{Inflation}_{07-08} = (0.0698 - 0.067) \div 0.067 = 0.0418 \rightarrow 4.18\%$$

Chapter 20: Short-term Economic Fluctuations

Review questions

1. A recession is a period in which the economy is growing at a rate significantly lower than normal. An expansion is a period in which the economy is performing at a rate significantly above normal. The beginning of a recession is called a peak and its ending point is called a trough.
2. The term business cycle is a misnomer because a cycle is something that occurs with regularity and can be predicted, whilst market fluctuations are irregular in length and severity and are difficult to predict, meaning that peaks and troughs are also very difficult to forecast.
3. The producer of the automobile, which is a durable good, will see his profits reduced the most, then the shoe manufacturer and then the janitorial service. This is so because durable goods are more long-term orientated and are usually more expensive. Thus, when the economy is performing poorly people will be less likely to buy something as expensive as a new car. On the contrary, janitorial services are not that expensive and are needed regularly no matter what, so their demand will not be as affected.
4. Natural unemployment rate – unaffected
Cyclical unemployment rate – will increase
The inflation rate – will decrease
5. Potential output is the maximum sustainable amount of output that an economy can produce. It is possible for an economy to produce at levels higher than potential output if it is employing its resources at unsustainably high rates.
6. False. For example, a reduction in spending lower current output, which does not necessarily equal potential output. A significant decrease in spending will thus produce a recessionary gap and cause a recession.
7. False, when output is equal to potential output, cyclical unemployment is equal to 0, but the natural rate of unemployment still exists.
8. Okun's law: $(Y^* - Y) \div Y^* = 2 \times (u - u^*)$

$$-(Y^* - 0.98Y^*) \div Y^* = 2 \times (u - 0.05)$$

$$0.02 \div 2 = u - 0.05$$

$$u = 0.06 \text{ (6\%)}$$

$$-(Y^* - 1.02Y^*) \div Y^* = 2 \times (u - 0.05)$$

$$-0.02 \div 2 = u - 0.05$$

$$u = 0.04 \text{ (4\%)}$$

Problems

1. a. In the 1981-1982 Recession there were four quarters of negative real GDP growth. In the 1990-1991 Recession there were two quarters of negative real GDP growth. During the 2001 recession there were two quarters of negative real GDP growth.

b. Only the 1990-1991 recession satisfied the informal criterion that a recession must have two consecutive quarters of negative GDP growth.

2.

$$\text{- Output gap}_{1999} = (\$9,470 - \$9,248) \div \$9,248 = 0.024 / 2.4\% \text{ expansionary}$$

$$\text{Output gap}_{2000} = (\$9,817 - \$9,590) \div \$9,590 = 0.0238 / 2.38\% \text{ expansionary}$$

$$\text{Output gap}_{2001} = (\$9,891 - \$9,927) \div \$9,927 = -0.0036 / -0.36\% \text{ recessionary}$$

$$\text{Output gap}_{2002} = (\$10,049 - \$10,227) \div \$10,227 = -0.0174 / -1.74\% \text{ recessionary}$$

$$\text{Output gap}_{2003} = (\$10,301 - \$10,501) \div \$10,501 = -0.019 / -1.9\% \text{ recessionary}$$

$$\text{Output gap}_{2004} = (\$10,676 - \$10,777) \div \$10,777 = -0.0094 / -0.94\% \text{ recessionary}$$

$$\text{Output gap}_{2005} = (\$11,003 - \$11,068) \div \$11,068 = -0.0059 / -0.59\% \text{ recessionary}$$

$$\text{Output gap}_{2006} = (\$11,319 - \$11,372) \div \$11,372 = -0.0047 / -0.47\% \text{ recessionary}$$

$$\text{Output gap}_{2007} = (\$11,567 - \$11,687) \div \$11,687 = -0.0103 / -1.03\% \text{ recessionary}$$

- Year-to-year growth rates of RGDP

$$\text{Formula: } (RGDP_{t2} - RGDP_{t1}) / RGDP_{t1} * 100$$

$$1999-2000: 3.66\%$$

$$2000-2001: 0.75\%$$

$$2001-2002: 1.6\%$$

$$2002-2003: 2.51\%$$

2003-2004: 3.64%

2004-2005: 3.06%

2005-2006: 2.87%

2006-2007: 2.19%

- A recession occurred between 2001 and 2007.

3. Research more useful if done individually

4. Okun's law: $(Y^* - Y) \div Y^* = 2 \times (u - u^*)$

a. $(8,000 - 7,840) \div 8,000 = 2 \times (0.06 - u^*)$

$u^* = 0.05 / 5\%$

b. $(8,100 - Y) \div 8,100 = 2 \times (0.05 - 0.05)$

$8,100 - Y = 0$

$Y = 0$

c. $(Y^* - 8,200) \div Y^* = 2 \times (0.04 - 0.045)$

$-1.01 \times Y^* = -8,200$

$Y^* = 8,119$

d. $(8,415 - 8,250) \div 8,415 = 2 \times (0.05 - u)$

$u = 0.0402 / 4.02\%$

Chapter 21: Spending and Output in the Short Run

Review questions

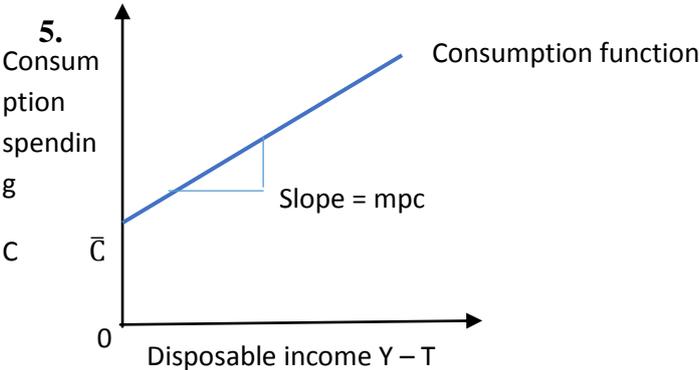
1. The key assumption of the basic Keynesian model is that firms meet the demand for their products at preset prices. That is, output at each point in time is determined by the amount people throughout the economy want to spend, which is planned aggregate spending.

2. Standardized goods which are traded in large quantities such as wheat and oil, have frequent price changes. Goods whose price changes relatively infrequently are usually those goods that are not standardized and are not sold in large quantities. An example is clothes. The prices of wheat and oil vary frequently, because the benefits setting up market auctions for these goods exceed the costs.

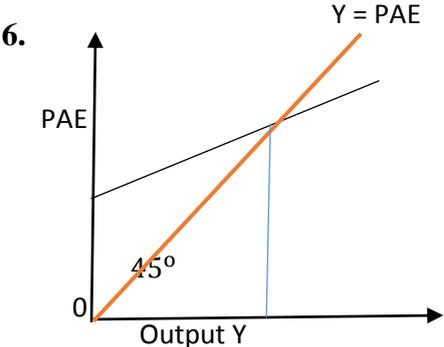
3. Planned aggregate expenditure is total planned spending on final goods and services. It has four components: consumption, planned investment, government purchases and net exports. Consumption is spending by households on final good and services. Planned investment is spending by firms on goods, services and planned inventories. Government purchases include

spending by the government on goods and services. Net exports is exports minus imports. Planned spending changes as output changes, because an increase in output implies and equal increase in income. When income increases, people tend to spend more, so consumption goes up as well, so planned aggregate expenditure increases.

4. Planned spending includes what a firm plans to include in its inventory. So if a firm does not sell what it was planning to, the amount of goods it adds to its inventory will also differ from what it was planning to add. For example, if a firm produces 100 units from which it is expecting to sell 80 and add 20 to its inventory, but it actually sells all 100 units, then its actual investment will be lower than its planned investment.



- a. A movement from left to right on the graph of the consumption function means that consumption has increased due to an increase in disposable income.
- b. A parallel upward shift of the consumption function shows that people are consuming more for any given level of disposable income, meaning that the change in consumption is brought about by a factor other than disposable income. Such a factor is, for example, an increase in government spending.



The $Y=PAE$ shows all points where output and PAE are equal. It represents an equilibrium condition and short-run equilibrium output must lie on it. The expenditure line shows the dependence of planned aggregate expenditure on output, and because the relationship between the two is positive, the expenditure line is upward-sloping. Autonomous expenditure is given by the vertical intercept of the expenditure line, induced expenditure is the amount of PAE

that is dependent on Y . In an equation such as $PAE = 960 + 0.8Y$, the $0.8Y$ part represents induced expenditure. We can see it reflected in the slope of the expenditure line, which is equivalent to the mpc . Short-run eqbm output is given where the expenditure and the $Y=PAE$ lines intersect. To find induced expenditure, draw a horizontal line from the intersection of $Y = PAE$ and the expenditure line to the vertical axis. The difference between the resulting point on the vertical axis (which equals total aggregate expenditure) and the intercept of the expenditure line (which equals autonomous expenditure) gives induced expenditure.

7. A multiplier measures how a change endogenous variable affects an exogenous variable. That is, it shows how a change in a factor which is determined outside the model affects a variable, which is determined within the model. In economic terms the multiplier is higher than one, because, for example, if you have an increase of x in spending the overall effect on the economy will be greater than x , because the increase in spending (and thus, in GDP) will lead to increases in other forms of expenditure as well. So, x is multiplied by a number, greater than 1.

8. Because of the increase in government spending, autonomous expenditure will rise by 50 units. Tax cuts will raise disposable income by 50 units, which stimulates planned expenditure, this way raising consumption spending. In the case of taxes, however, planned expenditure increases by 50 units times the mpc . Since the mpc is smaller than one, autonomous expenditure will be increased by less than 50 units. This means that, out of the two, an increase in government purchase will have a stronger impact on planned aggregate expenditure. Thus the increase in government purchases is predicted to have the greater impact on planned aggregate expenditure.

9. The use of fiscal policy to stabilize the economy is more complicated than the Keynesian model suggests, because affects potential output and the level of government debt. What is more fiscal policy can be costly and time-consuming and is not always flexible enough to be used for short-term stabilization.

Problems

1. Output = 4m

$I = 1.5m$ (planned)

Inventory = 0.5m

a. sells only 3.85m (has 0.15m left)

$I^* = 1.5 + 0.15 = 1.65m$

$I^P = 1.5m$

b. Sells 4m

$I^* = I^P = 1.5m$

c. Sells 4.2m

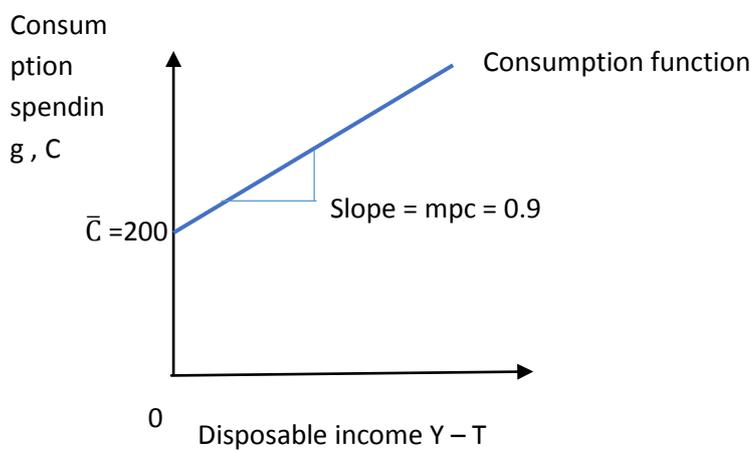
$$I^* = -0.2 + 1.5 = 1.3m$$

$$I^P = 1.5$$

- Output is equal to short-run equilibrium output in case b) where actual and planned investment are the same.

2. a.

Before-tax income (\$)	Taxes (\$)	Disposable income (\$) (YD)	Consumption spending (\$)	MPC = dC/dYD
25,000	3,000	22,000	20,000	-
27,000	3,500	23,500	21,350	$1,350/1,500 = 0.9$
28,000	3,700	24,300	22,070	$720/800 = 0.9$
30,000	4,000	26,000	23,600	$1,530/1,700 = 0.9$



$$b. C = \bar{C} + mpc \cdot YD \rightarrow \bar{C} = 200$$

$$YD = 27,000$$

$$C = 200 + 27,000 \cdot 0.9$$

$$C = 24,500$$

$$c. \bar{C} \text{ goes up to } 1,200$$

The curve shifts upward by a 1,000 from the point 200 to 1,200.

- MPC remains unaffected, because the change in consumption is the same for each level of disposable income, and the line makes a parallel upward shift.

3. a. $PAE = C + I^P + G + NX = 1,800 + 0.6*(Y - T) + 900 + 1,500 + 100 = 3,400 + 0.6*Y$

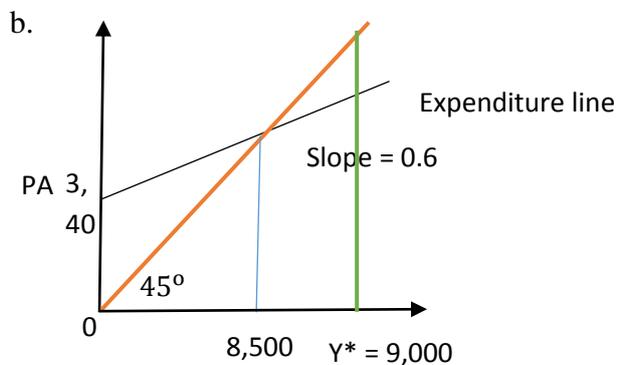
b. Autonomous expenditure = 3,400

Induced expenditure = $0.6*Y$

4. a.

Output (Y)	Planned aggregate expenditure $PAE = 3,400 + 0.6*Y$	$Y - PAE$	$Y = PAE?$
8,200	8,320	-120	No
8,400	8,440	-40	No
8,600	8,560	40	No
8,800	8,680	120	No
9,000	8,800	200	No

For $Y = PAE \rightarrow Y = 3,400 + 0.6*Y \rightarrow 0.4*Y = 3,400 \rightarrow$ Short-run equilibrium output (Y) = 8,500



Disposable income $Y - T$

There is a recessionary output gap 500

c. Okun's law: $(Y^* - Y) \div Y^* = 2 \times (u - u^*)$

$(9,000 - 8,500) \div 9,000 = 2 \times (u - 0.04)$

$u = 0.028 + 0.04 = 0.068 \rightarrow 6.8\%$

5. a. PAE will increase by 100

$$0.4*Y = 3.500 \rightarrow Y = 8,750$$

b. PAE will increase by 60 (because in the PAE equation we have $-0.6*T$)

$$0.4*Y = 3,460 \rightarrow Y = 8,650$$

c. PAE goes down by 100

$$0.4*Y = 3,300 \rightarrow Y = 8,250$$

$$\text{Multiplier} = 1/(1 - \text{mpc})$$

$$\text{Multiplier} = 1/(1 - 0.6) = 1/0.4 = 2.5$$

$$6. \text{mpc} = 0.75$$

$$\text{Multiplier} = 4$$

a. Since the multiplier is equal to 4, a 1 unit fall in planned investment will lead to a 4 times larger fall in output, so the recessionary gap will be 4 times larger than the fall in investment.

b. To restore the economy to full employment, that is to eliminate the recessionary gap, the government must increase its spending by the same amount as that of the fall in investment, this will cause output to rise by an amount four times larger due to the fact that the multiplier is equal to four.

c. The tax multiplier is equal to (in the case of a closed economy such as this one):

$$\text{tax multiplier} = - \text{mpc}/(1 - \text{mpc})$$

$$4*\Delta I = [- \text{mpc}/(1 - \text{mpc})]* \Delta T \quad (\Delta I \text{ means change in } I)$$

$$4*\Delta I = [- 0.75/(1 - 0.75)]* \Delta T$$

$$\Delta I = -(4/3) \Delta T$$

-> In order to offset the fall in investment and restore the level of output, the government must decrease taxes by 4/3

d. What they can do is adjust the tax code and raise taxes on economic activities which do not have a large negative impact on jobs and spend the generated revenue on measures that have a large positive impact on jobs.

$$7. \text{a. PAE} = C + I^P + G + NX = 40 + 0.8*(Y - T) + 70 + 120 + 10 = 120 + 0.8*Y$$

$$\text{b. } Y = 120 + 0.8*Y$$

$$0.2*Y = 120$$

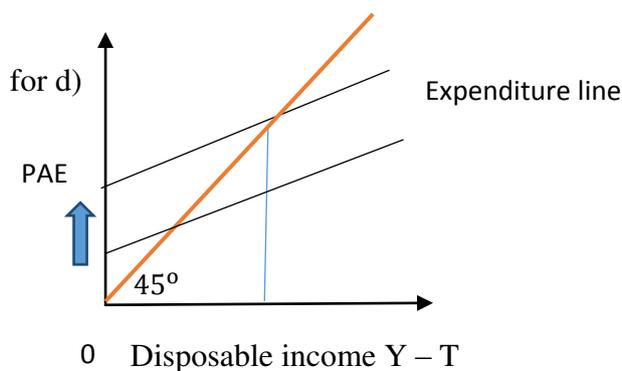
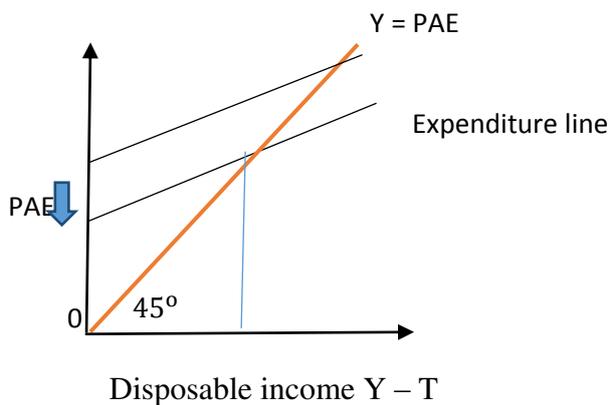
$$Y = 600$$

c. $Y - Y^* = 600 - 580 = 20$, so there is an expansionary gap of 20

- the multiplier is 5, so a decrease in government purchases by 4 (from 120 to 116), will lower output by 20. In the case of taxes, to decrease autonomous expenditure by 4, we need to keep in mind that a change in taxes will change autonomous expenditure by $mpc \cdot (\text{change in taxes})$. In this case the mpc is 0.8, so to reduce autonomous expenditure by 4, we need to increase taxes by 5 (from 150 to 155).

d. $Y^* = 30$, and $Y = 600$, we have a recessionary gap of 30. Since the multiplier is 5, we need to increase government spending by 6 (from 120 to 126) in order to raise autonomous expenditure by 30. In the case of taxes, since the mpc is 0.8 and the change in autonomous expenditure we're aiming at is equal to 6, we have to reduce taxes by 7.5 (from 150 to 142.5).

e. for b, c.



$$8. PAE = C + I^P + G + NX = 3,000 + 0.5(Y - T) + 1,500 + 2,500 + 200 = 6,200 + 0.5Y$$

$$\text{Autonomous expenditure} = 6,200$$

$$\text{Multiplier} = 1/(1 - mpc) = 1/0.5 = 2$$

Short-run eqbm output:

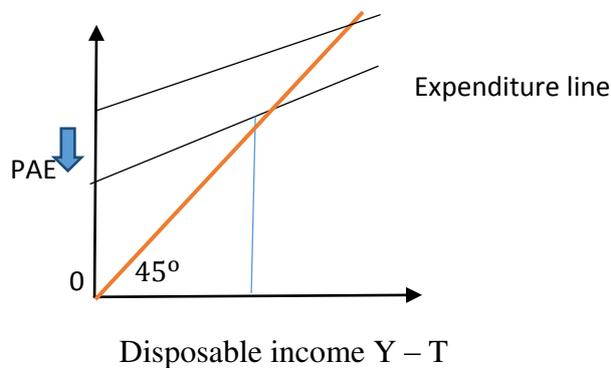
$$Y = PAE = 6,200 + 0.5Y$$

$$0.5Y = 6,200$$

$$Y = 12,400$$

$$\text{Output gap} = 400 \text{ (expansionary)}$$

Since the multiplier is equal to 2 (falls from 6,200 to 6,000), in order to reduce Y by 400, we need to reduce autonomous expenditure by 200.



9. a. Like 8, but $NX = 0$, so $Y = 6,000 + 0.5Y$

$$Y = 12,000$$

b. NX is now 100

$$Y = 6,100 + 0.5Y$$

$$Y = 12,200 \text{ (Y rises by 200)}$$

.) $NX = -100$

$$Y = 5,900 + 0.5Y$$

$$Y = 11,800 \text{ (Y decreases by 200)}$$

d. A weak economy in one country will reduce this country's imports from other countries, which will weaken the economy in the second country as well, because it will lower its exports. And as we see here Y decreases as exports go down.

$$10. \text{ a. } PAE = C + I^P + G + NX = \bar{C} + mpc(Y - T) + \bar{I} + \bar{G} + \bar{NX} = \bar{C} + mpc(Y - tY) + \bar{I} + \bar{G} + \bar{NX} = \bar{C} + \bar{I} + \bar{G} + \bar{NX} + Y(1 - t)mpc$$

$$Y = PAE = \bar{C} + \bar{I} + \bar{G} + \bar{NX} + Y(1 - t)mpc$$

$$Y[1 - mpc(1-t)] = \bar{C} + \bar{I} + \bar{G} + \bar{NX}$$

$$Y = (\bar{C} + \bar{I} + \bar{G} + \bar{NX}) / [1 - mpc(1-t)]$$

b. The multiplier here is $1/[1 - (1-t)mpc]$, since t is smaller than 1, this multiplier is smaller than the standard multiplier $1/(1-mpc)$. This is so, because if $t < 1$ and mpc is also < 1 , then the denominator will be a number close to 1, which means that the fraction itself will have a lower value than $1/(1-mpc)$ where the number in the denominator is smaller.

c. In a. we see that Y is equal to the multiplier times autonomous expenditure. So the smaller the multiplier, the less will Y be affected by fluctuations in autonomous expenditure.

$$d. Y = (500 + 1,500 + 2,000) / [1 - 0.8(0.75)]$$

$$Y = 4,000 / 0.4 = 10,000$$

$$\text{Multiplier} = 1 / 0.4 = 2.5$$

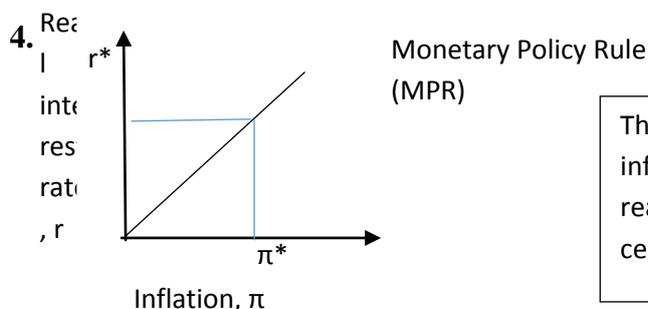
Chapter 22: Stabilizing the Economy: The Role of the Central Bank

Review questions

1. Decisions made by households and businesses to spend and invest (which affect PAE) depend on the real interest rate. A high interest rate will encourage people to save and will raise their opportunity cost on spending and borrowing money for consumption and investment, so PAE will go down. The opposite will happen when interest rates are low.

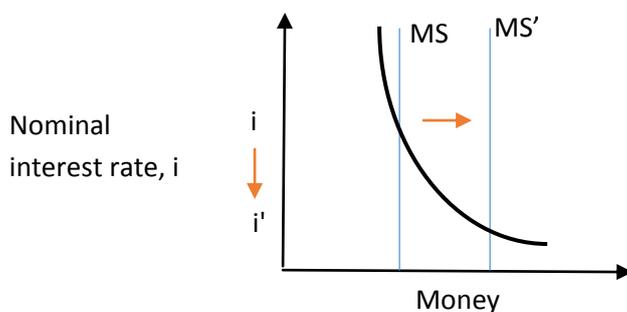
2. A bank facing a recessionary gap would want to encourage spending and investment, so it will have to lower the real interest rate. To do so, it must increase the quantity of money supplied in the economy, so it will initiate an open-market purchase of bonds, which will put more cash in the hands of the public. This will increase the money supply and will lower interest rate, so investment and consumption will rise, driving PAE up.

3. The central bank would take a contractionary policy action when it is facing an expansionary gap and, consequently, high inflation. With this policy it aims to increase interest rates, in order to discourage consumption and investment. Thus, the real and nominal interest rates will increase, and the money supply will decrease.



The Monetary Policy Rule is upward-sloping, because when inflation is above target inflation π^* , the central bank sets the real interest rate above r^* . When inflation is below π^* , the central bank sets the real interest rate below r^* .

5. The Central bank can control the nominal interest rate by changing the money supply.



Yes, it can control the real interest rate as well, because since inflation changes relatively slowly, an increase in the nominal interest rate will lead to an increase in the real interest rate for the Fischer equation to hold.

6. An open-market purchase of bonds by the central bank will lower nominal interest rates. Bond prices will increase (negative relationship with the interest rate) and money supply will increase.

Problems

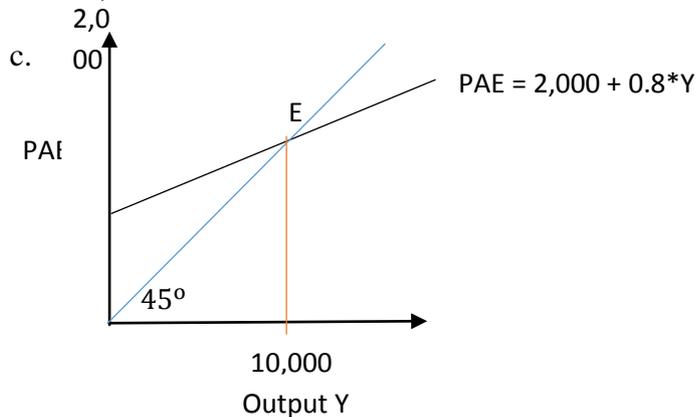
1. a. $PAE = C + I^P + G + NX$

$$PAE = 2,000 + 0.8*Y$$

b. Short- run equilibrium output: $PAE = Y$

$$Y - 0.8*Y = 2,000$$

$$Y = 10,000$$



2. a. $Y^* = 12,000$ $r^* = ?$ (r^* is a function of Y^*)

$$Y = C + I + G$$

$$Y = 2,600 + 0.8(Y - 3,000) - 10,000r + 2,000 - 10,000r + 1,800$$

$$0.2Y = 4,000 - 20,000r \text{ (we use } Y^* = 12,000\text{)}$$

$$2,400 = 4,000 - 20,000r$$

$$r^* = 0.08 \text{ (=8\%)}$$

b. $0.2Y = 4,000 - 20,000r$ (we use $Y^* = 9,000$)

$$1,800 = 4,000 - 20,000r$$

$$r^* = 0.11 \text{ (=11\%)}$$

c. $r = 0.08$

$$I^P = 2,000 - 10,000*r = 2,000 - 800 = 1,200$$

$$\text{National saving} = Y^* - C - G = 12,000 - [2,600 + 0.8(12,000 - 3,000) - 10,000*r] - 1,800 = 12,000 - 9,000 - 1,800 = 1,200$$

$$I^P = \text{National saving} = 1,200$$

3. a. $PAE = C + I^P + G + NX$

$$PAE = 27,600 + 0.5*Y - 60,000*r$$

b. $Y = Y^* = PAE$

$$0.5*Y^* = 27,600 - 60,000*r$$

$$Y^* = 55,200 - 120,000*r$$

$$Y^* = 40,000$$

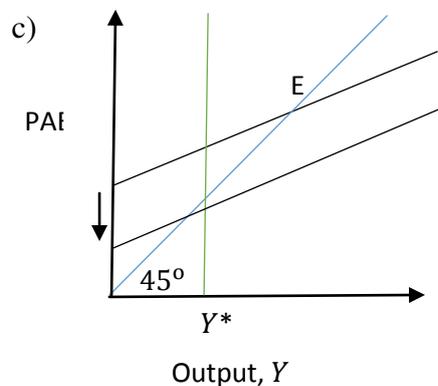
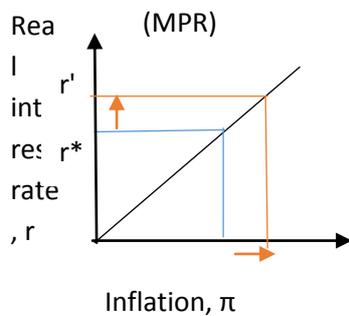
$$40,000 - 55,200 = -120,000*r$$

$$r = 0.127 \rightarrow 12.7\%$$

4. a. In order to catch up with the rise in inflation, the central bank will raise the real interest rate.

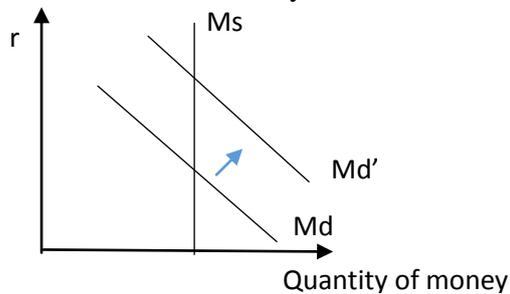
b) An increase in the real interest rate will lower consumption and investment, so PAE will go down.

c. Monetary Policy Rule



d. To lower inflation, the real interest rate will have to be increased, which will in turn lower planned aggregate expenditure and output. Actual output will be lower than potential output so a recessionary gap will arise. This shows that there is a tradeoff between keeping inflation low and maintaining output at its potential level.

5. a. The demand for money will rise, so the demand curve will shift to the right



b) If the central bank took no action, nominal interest rates would rise.

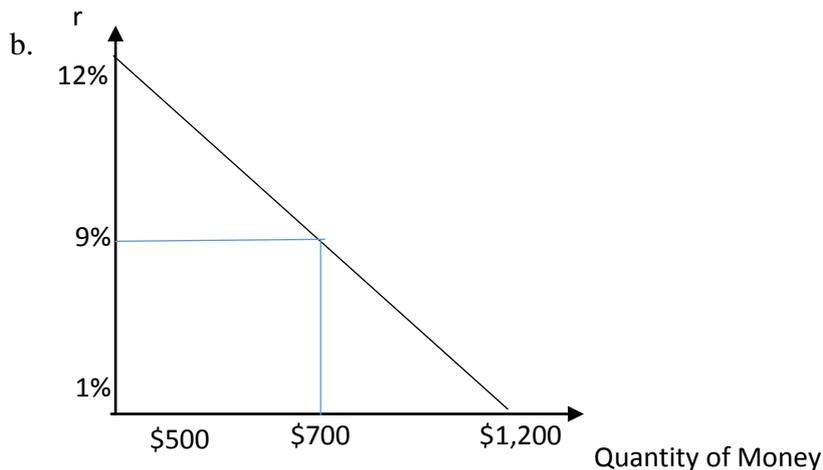
c) The Fed can increase the money supply to keep rates unchanged.

6.

Money holding	Cost at 9%	MC at 9%	Total benefit	Marginal benefit
\$500	\$45	-	\$35	-
\$600	\$54	\$9	\$47	\$12
\$700	\$63	\$9	\$57	\$10
\$800	\$72	\$9	\$65	\$8
\$900	\$81	\$9	\$71	\$6
\$1,000	\$90	\$9	\$75	\$4
\$1,100	\$99	\$9	\$77	\$2
\$1,200	\$108	\$9	\$77	\$0

-> at a rate of 9%, he will want to hold 700\$

- do same tables for 5% and 3% to find amount of money he wants to hold (marginal benefit must exceed marginal cost)



7. a. If the commission falls, bond and stock become more liquid. Now they are better substitutes for money, so the demand for money decreases.

b. Now credit cards are better substitutes for money, so the demand for money decreases.

c. This will make stocks less desirable, so the demand for money will increase.

d. This new advantage will make mutual fund investments more desirable, so money demand will go down.

e. This means that people will have a higher income and will want to spend more, so M_d will go up.

f. This will increase the demand for US currency, because it will be more secure than the certain countries' home currency.

8. a.

a.a Demand decreases, so the nominal interest rate falls (see fig 22.8 on page 662)

a.b Demand decreases, so the nominal interest rate falls

a.c Demand increases, so the nominal interest rate rises

a.d Demand decreases, so the nominal interest rate falls

a.e Demand increases, so the nominal interest rate rises

a.f Demand increases, so the nominal interest rate rises

b. To keep the nominal interest rate from changing it should alter the money supply by executing an open market sale or purchase of bonds (see fig 22.9 on page 663)

Chapter 23: Aggregate Demand and Aggregate Supply

Review questions

1. The two variables related by the aggregate demand curve are short-run equilibrium output (Y) and the rate of inflation (π). What the central bank does when inflation rises is to increase nominal interest rates, which in turn raises the real interest rate. This causes planned spending and short-run output to fall, so the AD curve slopes downward.

2. a. An increase in government purchases will increase exogenous spending, which will increase output and will cause the AD curve to shift to the right.

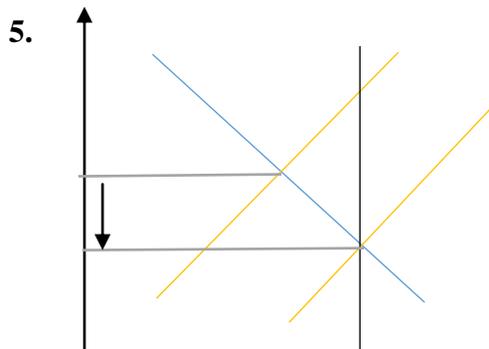
b. A cut in taxes will make people wealthier, which will lead to a higher level of consumption, so the AD curve will shift to the right.

c. A decline in planned investment spending by firms, will cause output to decline, which will shift the AD curve to the left.

d. A higher interest rate implies a higher both nominal and real interest rate. This will lower output and will cause the AD curve to shift to the left.

3. This is so, because prices of commodities are set on a day-to-day basis and can adjust quickly to changes in supply and demand. However, the prices of most goods and services are fixed and do not change on a daily basis, so with them people can afford to set an expected future rate of inflation, which in turn influences today's rate of inflation.

4. During expansionary gaps, the demand for goods in the economy is above its usual rate, so firms have to produce at rates above their capacity. In doing so, they incur costs, and to compensate, they raise their prices by more than their costs have risen (mostly reflected in labor costs, since capital is fixed in the short run). If this increase in prices happens on an aggregate level, the price level will rise. Thus, inflation rises when there is an expansionary gap. What is more, at this point when inflation rises and is above expected inflation, people will adjust their expectations to a higher level of inflation in the future, which will put upward pressure on wage contracts. This will cause wages to grow at a faster rate as well, which will also drive the price level up. The opposite happens during a recession. Firms will be selling less than they are capable of producing and to compensate for this discrepancy they will cut their prices. What is more, when output is below potential output, people will expect lower inflation in the future, which will be reflected in the lowering of wages and prices, which will put downward pressure on the price level.

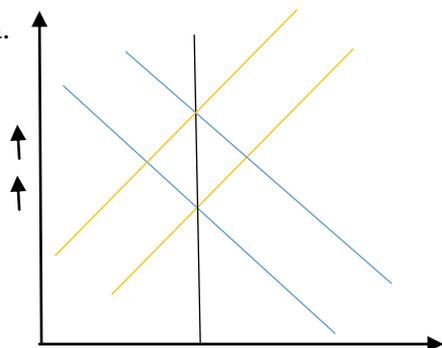


6. Not really, because stabilizing policy can be helpful, but it's effect takes time to implement itself so in the short-run a benefit is not noticeable.

7. An adverse inflation shock both raises inflation and lowers output. If policy makers implement a fiscal policy which shifts the AD curve to the right they will restore the level of output but will make the higher rate of inflation permanent. If they choose to do nothing and let the economy recover by itself, it eventually will do so but until this happens, there will be a long period of recession and a high level of unemployment.

Problems

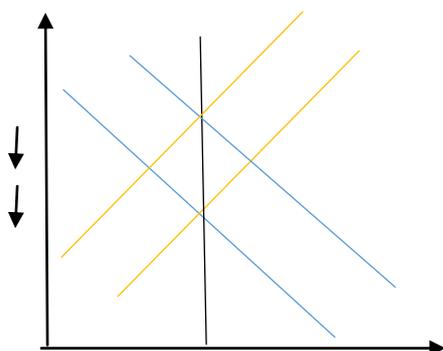
1. a.



b. The reduction in taxes increases disposable income, so people spend more and the AD curve shifts to the right. Same case and graph as a.

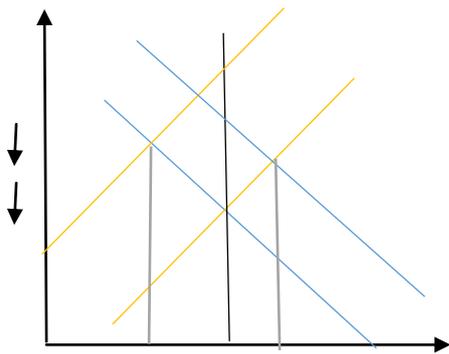
c. A loosening of monetary policy lowers the real interest rate. This will stimulate consumption and investment so the AD curve will shift to the right. Same case and graph as a.

d.



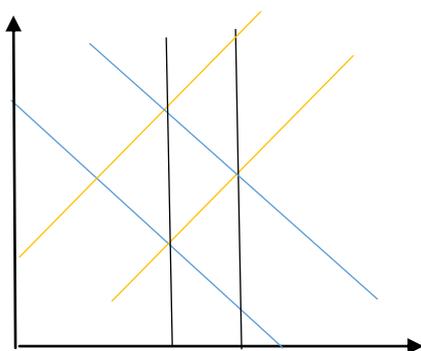
e. An increase in government spending causes the AD curve to shift to the right. Same case and graph as a.

2.



Due to the recessionary gap, people decrease their inflationary expectations in order to reach equilibrium output, so actual inflation also falls and the AS curve shifts to the right. The central bank adjusts to the change in inflation and lowers the real interest rate, so spending and output rise as inflation falls and the economy moves along the AD curve until it reaches the potential level of output. However, the effects of the tax cut hit the economy and the AD curve shifts to the right as disposable income rises, so now the economy is facing an expansionary gap.

3. If there is no policy response the economy will be at equilibrium at the intersection point between, the AD curve (which has not shifted), the AS curve which has shifted to the left and the LRAS curve, which has also shifted to the left. That is, now the economy will be in equilibrium at a lower level of output and higher level of inflation (equilibrium level 3). If the central bank adopts a tighter monetary policy, interest rates will rise investment spending will do down and inflation will fall. This will cause the AD curve to shift to the left, so now the economy will be at its initial, lower level of inflation, but the recessionary gap will be even larger (equilibrium level E3).



4. a. page 693 Fig 23.11 If the central bank adopt a looser monetary policy rule, interest rates will fall, spending will be stimulated, inflation will rise and the AD curve will shift to the right until it returns to potential output.

b. If the central bank does not change its monetary policy rule, the economy will self-adjust. The AD curve does not shift, and now people lower their inflationary expectations until the level of potential output is reached again.

5. a. In the short run $\pi = 0.04$

$$Y = 13,000 - 20,000 * 0.04 = 12,200$$

b. In the long run

$$Y = Y^* = 12,000$$

$$12,000 = 13,000 - 20,000 * \pi^*$$

$$\pi^* = (13,000 - 12,000) / 20,000 = 1,000 / 20,000 = 0.05 \rightarrow 5\%$$

6. $Y^* = 950$

$$\pi = 0.10$$

a. Short-run eqbm $\pi = 0.10$

$$Y = 1,000 - 1,000 * 0.10 = 900$$

Long-run eqbm $Y^* = 950$

$$\pi^* = (1,000 - 950) / 1,000 = 0.05 \rightarrow 5\%$$

b. Q0 $\pi = 0.1$ $Y = 900$

$$Q1 \pi = 0.10 - 0.0004 * (950 - 900)$$

$$Q1 \pi = 0.1 - 0.02 = 0.08$$

$$Q1 Y = 1,000 - 1,000 * 0.08 = 920$$

$$Q2 \pi = 0.08 - 0.012 = 0.068$$

$$Q2 Y = 932$$

$$Q3 \pi = 0.068 - 0.0072 = 0.0608$$

$$Q3 Y = 939.2$$

$$Q4 \pi = 0.05648$$

$$Q4 Y = 943.52$$

$$Q5 \pi = 0.0539$$

-> Yes, it does get closer to its 5% long-run value

Chapter 24: Macroeconomic Policy

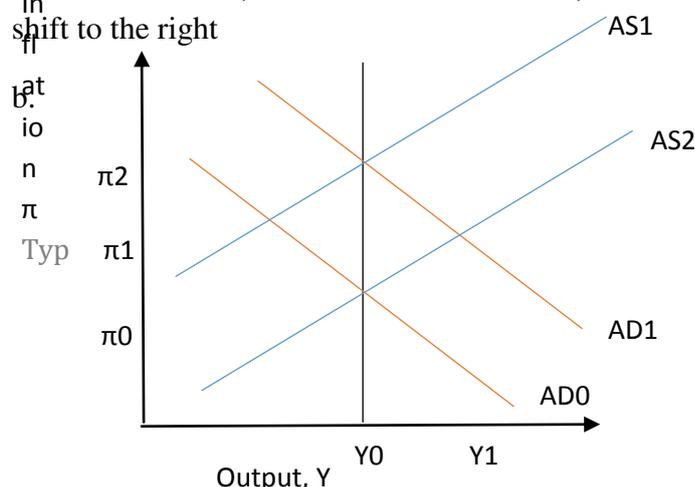
Review questions

- 1.** In the short run, a tighter monetary policy will lead to lower output, lower inflation and a higher real interest rate. In the long run output will return to its potential level, interest rates will rise, and inflation will decline.
- 2.** There will be a demand effect of people's decreased wealth brought up by the tax increase. Consumption will fall, with it output will fall, the AD curve will shift to the left and will lower inflation, causing a recessionary gap. If the central bank wants to adjust its target real interest rate to the long run real interest rate, then it will have to bring back output to its potential level. To do this it will loosen monetary policy, which will lower the interest rates, and raise inflation and will cause the AD curve to shift back to its initial position.
- 3.** In the short run output will fall and inflation will rise. In this case the central bank can either maintain inflation or stabilize output. The thing is that when deciding which of the two policies to pursue it would be good for the bank to know how long it would take the economy to self-adjust back to potential output, which to a large extent depends on what the public expects the central bank will do. Whether or not the public has anchored expectations (when they trust their central bank) affects if the economy will return to potential output quickly or not.
- 4.** Anchored inflationary expectations are observed when people's expectations of future inflation do not change even if inflation rises temporarily. They reduce the cost of an adverse inflation shock, because they minimize the second-round effects of that shock, and they increase the speed with which short-run the aggregate supply curve shifts down following an adverse inflation shock. This is so because people with anchored inflationary expectations believe that the central bank bring inflation back to its initial level as soon as possible, so they don't ask for inflationary wage increases and firms are thus not forced to raise their prices.
- 5.** The core rate of inflation is the rate of increase of all prices except energy and food. Since it excludes the two sources of the most volatile price changes, the central bank uses it as a short-run measure of the underlying inflation trend. Only if the core rate of inflation exceeds the central bank's target inflation rate, can it adopt a tighter monetary policy.
- 6.** The factors which determine a central bank's level of independence are the length of appointments to the central bank, whether or not the legislative branch frequently interferes in its actions and decision, whether or not its obliged to finance the country's debt by buying newly issued government bonds and the degree to which its budget is controlled by the country's executive or legislative government branch. The benefits of having an independent central bank is that when it is independent it can efficiently serve its purpose, instead of having to comply with the desires of politicians. What is more when the central bank has a good reputation people tend to trust its decisions, which also helps it work more efficiently.

7. At tax rate reduction shifts the AD curve to the right. If the supply-side effects of the reduction are strong, the LRAS curve will also shift to the right that is they will both increase for any given level of inflation.

Problems

1. a. A looser monetary policy implies lower interest rates, which will cause consumption and investment to rise, which will increase PAE, and consequently, output, so the AD curve will shift to the right

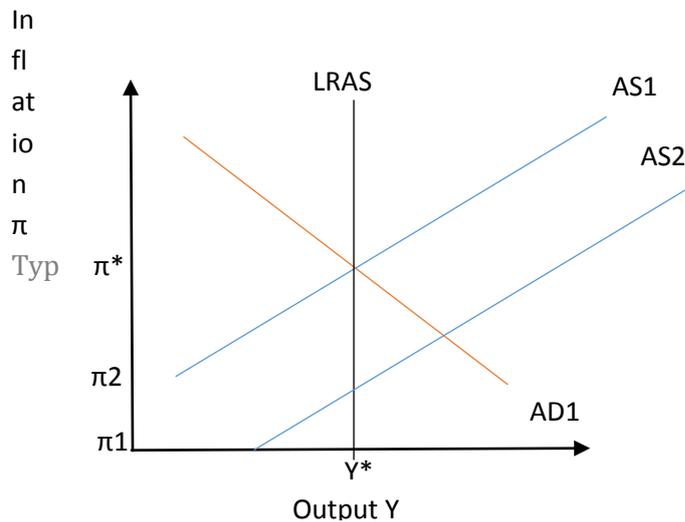


In the short run output will go up, because of the lower interest rate. The created expansionary gap will cause inflation to rise. In the long run, the actual level of inflation (π_1) will be above the expected level of inflation (π_0) so people will raise their inflationary expectations and the AS curve will shift to the right. Due to the central bank's monetary policy rule we will have a leftward movement along the AD curve. Thus, in the long run we end up with the initial output level at a higher inflation rate.

2. a. In the short run the AS curve will shift to the right.

b. The central bank will accommodate the shock by tightening monetary policy. It will lower the long-run inflation target to the one workers and firms expect after the favorable shock. This will increase the real interest rate at every inflation rate and will shift the AD curve to the left. This way output will return to potential output. The AS curve does not shift again because the central bank adjusted the inflation rate so that it equals expected inflation. (for graph, see fig. 24.2 on p. 709; is the opposite of that graph)

c. If the central bank does not accommodate the favorable supply shock the economy will self-adjust. The central bank will stick to its long run inflation target, and will lower interest rates. This way actual inflation (π_2) will be higher than what people expected following the supply shock (π_1). As a consequence, they will adjust their expectations to a higher rate of inflation which will start shifting the AS curve back to its initial. This will stop once long run equilibrium is restored and inflation and output are at their initial levels.



3. a. If the effect is stronger on AD than on LRAS we will have an increase in both short term and long term output. Inflation in this case will increase. (figure like one on page 721, just different magnitudes of shifts)

b. If the effect is stronger on LRAS than on AD we will have an increase in both short term and long term output. Inflation in this case will decrease. (figure like one on page 721, just different magnitudes of shifts)

4. a. The decrease in house prices, means that the value of a major asset (the house has declined) so wealth falls as well. Since exogenous consumption falls, consumption as a whole decreases. Since consumption is a component of output, the AD curve shift to the left, which will open a recessionary gap and the inflation rate will fall.

b. It accommodate its policy. (see fig 24.2 on p. 706, this case is opposite of figure illustrated) The AD curve will remain at its new level and since now inflation is below expected inflation, the AS curve will shift to the right, because people will revise their inflationary expectations. This will go on until the rightward shift in the AS curve brings the economy to its initial equilibrium.

c. i. The adverse inflation shock will shift the AS curve to the left.

ii. If the central bank eases monetary policy, this will close the gap, but will raise the level of inflation, so there is a tradeoff between closing the recessionary gap and keeping the price level low.

5. A tighter monetary policy might be politically unpopular, because it increases the interest rate, which increases the firm's cost of borrowing and consequently their output. Business owners who are also voters will not be happy when their operation is being forced to go down, because of a tighter monetary policy so the running party might lose supporters.

6. a. If the core rate of inflation remains unchanged after the increase in oil or food prices, the central bank might infer that people's inflationary expectations have not changed, meaning that there will be no second-round effects of the inflation shock. What is more, since the core rate of inflation has not changed, the central bank might expect the effects of the supply shock on inflation are also more likely to be temporary.

b. In the core rate of inflation rises substantially, the central bank might infer that people's inflationary expectations have increased and that there will be second-round effects of the inflation shock. These second-round effects constitute further changes in wages, and nonoil and nonfood prices. What the central bank might do in response is adopt a tighter monetary policy.

7. An advantage of having an independent central bank, that is, of having central bankers unbiased by short-term political interests, is that the credibility of monetary policy is enhanced. This makes it easier for the central bank to achieve its price stability and output goals. Another advantage of its independence is that it allows the central bank to work keeping in mind a long term view of the economy. The features that make a central bank independent are long terms of appointment of central bankers (so that they cannot be affected by politicians who are appointed for shorter terms), seldom interference by the legislative branch, the lack of obligation to reduce government deficits by buying government bonds and the option to set and control its own budget.

8. a. Given that the difference between the estimated natural rate of unemployment and the actual rate of unemployment is only half a percentage point, and holding in consideration the fact that macroeconomic policymaking is an inexact science, you might think that the difference has come about as a consequence of a measurement error and decide to not follow your recommended policy response. What is more, when cyclical unemployment is that low, there exists the risk that the use of policy will not hit the target of full employment, and the economy will instead jump from a recessionary to an expansionary gap which is not a desirable outcome.

b. Here, however, the difference between the estimated and actual values is three percentage points you might be more inclined that there is indeed disequilibrium and decide to go ahead with your recommended policy measure, despite the fact that macroeconomic policymaking is an inexact science.

Chapter 25: Exchange Rates and the Open Economy

Review questions

1. Japanese yen = 110 yen/dollar

Mexican peso = 10 pesos/dollar

110 yen = 10 pesos = 1 dollar

-> 1 yen = 10/110 pesos = 0.09 pesos per yen

-> 1 peso = 110/10 yen = 11 yen per peso

2. US households supply dollar to the foreign exchange market in order to obtain foreign currencies with which they can purchase foreign goods, services and assets. Foreigners demand dollars in exchange for their own currency in order to purchase US goods, services and assets.

3. An easing of monetary policy will cause the real interest rate to fall. This will make domestic assets less attractive to financial investors, so foreigners will want to buy less assets

from the country at hand, so they will demand less of its currency. The value of the exchange rate falls, that is it depreciates. This will make domestic goods and services cheaper when compared with their foreign counterparts, so domestic producers will export. The increase in net exports raises aggregate demand, which strengthens the effect of the looser monetary policy on output and employment. Generally, when the exchange rate is flexible, changes in it reinforce the effects of an easing or tightening monetary policy.

4. An overvalued exchange rate occurs when the official value of a fixed exchange rate exceeds its fundamental value, as determined by supply and demand in foreign exchange markets. Ways to fight this include devaluation, imposing restrictions on trade and capital flows, tightening monetary policy to include the exchange rate's fundamental value and using international reserves to buy back the excess supply of domestic currency. If we use devaluation, that is changing the value of the exchange rate whenever its fundamental value changes, we might as well have a flexible exchange rate. Imposing restrictions on trade hurts economic efficiency and growth. Using monetary policy has the drawback that it can no longer be available for stabilizing output and employment. Using international reserves depletes the central bank's reserves.

5. A flexible exchange rate tends to strengthen the ability of monetary policy to stabilize output. In contrast, under fixed exchange rates, monetary policy must be used to keep the fundamental of the exchange rate near the official value, and thus it is no longer available to use for stabilization purposes. Fixed exchange rates are more predictable than flexible exchange rates in the short run, as flexible exchange rates vary from moment to moment with shifts in supply and demand in the foreign exchange market.

6. Nominal exchange rate – the rate at which two currencies can be traded for each other. Real exchange rate – the price of the average domestic good or service relative to the price of the average foreign good or service, when prices are expressed in terms of a common currency.

Real exchange rate = price of domestic good/ price of foreign good in domestic currency

$$= P/(P_f/e) = e \cdot P/P_f$$

e – nominal exchange rate

7. Crude oil is a standardized product, what is more, its transportation costs are low in comparison with its price, so the law of one price would apply to it. The possible spoilage of milk when transported over long distances increases its transportation costs, so the law of one price should not apply to it. Taxi rides are not traded internationally so the law of one price will not apply to them.

Problems

1. Swiss cheese = 20 €/kg

a. e = 0.8 €/ per 1 dollar

$$1 \$ = 0.8 €$$

$$1 € = 1/0.8 \$ = 1.25 \text{ dollars/euro}$$

1. $1.25 \times 20 = 25$ -> the cheese will cost 25\$ per kg

b. if $e = 1$ euro per dollar the cheese will cost 20\$ per kg

c. the supply of dollars in the foreign exchange market will rise

2. a. if the exchange rate is 1 euro per 1 dollar, the iPod will cost 240 euro

b. $e = 0.8$ euro per dollar, so the iPod in Europe will cost $0.8 \times 240 = 192$ euro

c. as the dollar becomes cheaper in terms of euro, French purchases of iPods will increase and the demand for dollars will increase

3. a. since UAE stocks are now perceived as riskier, the dirham's demand and value will go down

b. since EU countries switch from UAE software to Indian software, the demand and value of the dirham will go down

c. same as a. and b.

d. people will be more willing to buy UAE cars because foreign ones are more expensive because of the tariff, so the demand and value of dirham will go up

e. this means that it will increase the money supply in order to inject funds in the economy and lower interest rates, which will cause inflation to rise, which will cause the dirham to depreciate

f. the dirham will become stronger and its value will go up

4. *The demand equation should be: $30,000 - 8,000 \cdot e$

a. set demand and supply to be equal to find equilibrium

$$30,000 - 8,000 \cdot e = 25,000 + 12,000 \cdot e$$

$$20,000 \cdot e = 5,000$$

$$e = 0.25 \text{ dollars per dinar}$$

$$\text{equilibrium} = 28,000 \text{ dinars}$$

b. e is fixed at 0.30 dollars per dinar, the dinar is overvalued

$$\text{Supply} = 28,600$$

$$\text{Demand} = 27,600$$

$$\text{BoP deficit} = 28,600 - 27,600 = 1,000 \text{ dinars}$$

There is excess supply of 1,000 dinars, so over time the international reserves of dinars increases. To buy the excess supply of dinars in the foreign exchange market, the government will have to use 1,000 dinars' worth of reserves each period (which is equal to \$300), so over time the country's international reserves will decline.

c. $e = 0.20$ dollars per dinar, the dinar is now undervalued

Supply = 27,400

Demand = 28,400

BoP surplus = $28,400 - 27,400 = 1,000$ dinars

To keep up with this difference, the country must print 1,000 dinars per period in order to buy the dollars offered in the foreign exchange market. This way its international reserves will grow over time.

5. $e = 0.30$ dollars per dinar; international reserves = \$600;

checking accounts of foreign investors = 5,000 dinars

a. Yes, as long as the country doesn't try to convert its dollar reserves into dinars.

b. If they expect a devaluation of the dinar to 0.25 dollars per dinar, their accounts will be worth a total of 1,250 dollars, implying a loss of \$250, so they should be concerned about a devaluation of the dinar

c. By trying to exchange their dinars, they will increase the dinar supply, which will devalue the currency

d. It can be considered as such, because by trying to avoid a devaluation of the dinar they actually caused one

6. *Demand equation should have $+ 50,000(re - rw)$

a. The way the two interest rates appear makes economic sense, because if the real interest rate in Eastland (E) exceeds that in Westland (W), investors from W will want to buy E assets, so they will demand eastmarks. The demand equation shows that a higher difference in the real interest rates of the two countries will lead to a higher demand for eastmarks, and the supply equation shows that the higher the difference in interest rates, the less eastmarks will be supplied in international markets. This is so because people in E get a higher return on their country's assets, so they are less willing to invest in W.

b. If the real interest rates are both equal to 10% the two terms including them drop out and we get

$$25,000 - 5,000 * e = 18,500 + 8,000 * e$$

$$e = 0.5 \text{ westmark per eastmark}$$

c. $rw = 0.12$, so $re - rw = 0.10 - 0.12 = -0.02$

$$25,000 - 5,000 * e + 50,000 * (-0.02) = 18,500 + 8,000 * e - 50,000 * (-0.02)$$

$$13,000 * e = 6,500 - 100,000 * (-0.02)$$

$e = 0.346$ westmark per eastmark, the market equilibrium value of the eastmark decreases

d. The depreciation of the eastmark makes E's goods cheaper abroad. Imports from W become more expensive. So E's NX and consumption of domestic goods will go up and its aggregate demand will also rise.

e. Eastland will have to raise its real interests to 12% to restore the exchange rate to 0.5 westmarks per eastmark. When the difference in the real interest rates is 0 the exchange rate will go back to 0.5 westmarks per eastmark. An increase in the real interest rate in E, however, will lower aggregate demand in E.

f. Because of the fixed exchange rate, E would be forced to match W's monetary tightening, even though it might not have been favorable for E's economy, which proves the point that maintaining a fixed exchange rate restricts a country's ability to use monetary policy freely to stabilize the economy.

7. $e = 1.50$ dollars per pound

The car costs £20,000, in dollars its price is $20,000 * 1.5 = \$30,000$

The price of the US car relative to the British car is $\$26,000 / \$30,000 = 0.87$, that is the US car is cheaper, meaning that US cars are priced more competitively.

8. Blueland:

Redland

Year1:

Year1:

CPI = 100

CPI = 100

$e = 1 \text{ \$}/\text{B} = 1 \text{ B}/\text{\$}$

$e = 0.5 \text{ \$}/\text{R} = 2 \text{ R}/\text{\$}$

$\rightarrow 1 \text{ B} = 2 \text{ R} \rightarrow e = 2 \text{ R}/\text{B}$

Year2:

Year2:

CPI = 110

CPI = 105

$e = 0.9 \text{ \$}/\text{B} = 1.11 \text{ B}/\text{\$}$

$e = 0.45 \text{ \$}/\text{R} = 2.22 \text{ R}/\text{\$}$

$\rightarrow 1.11 \text{ B} = 2.22 \text{ R} \rightarrow e = 2 \text{ R}/\text{B}$

Real exchange rate = eP/P_f

Year1 = $2 * 100 / 100 = 2$

Year2 = $2.22 * 110 / 105 = 2.095$

%change in real exchange rate = $(2.095 - 2) / 2 = 0.0475 \approx 5\%$

9. a. Gold = 350 lira = 2,800 pounds

1 lira = $2,800 \text{ pounds} / 350 \text{ lira} = 8 \text{ p}/\text{l} = 0.125 \text{ l}/\text{p}$

b. $4,200 \text{ pounds} / 350 \text{ lira} = 12 \text{ pounds}/\text{lira} (= 0.08 \text{ l}/\text{p}) \rightarrow$ the pound depreciates and the lira appreciates.

This shows the principle that the rate of inflation and the exchange rate in the home country are negatively correlated.

c. $e = 12 \text{ pounds/lira} \rightarrow \text{a barrel in Egypt will cost } 30 \text{ lira} * 12 \text{p/l} = 360 \text{ pounds}$

d. Gold = 350 lira

$e = 0.7 \text{ lira/dirham} = 1.43 \text{ dirham/lira}$

an ounce of gold in Morocco = $350 \text{ lira} * 1.43 \text{ dirham/lira} = 500.5 \text{ dirham}$

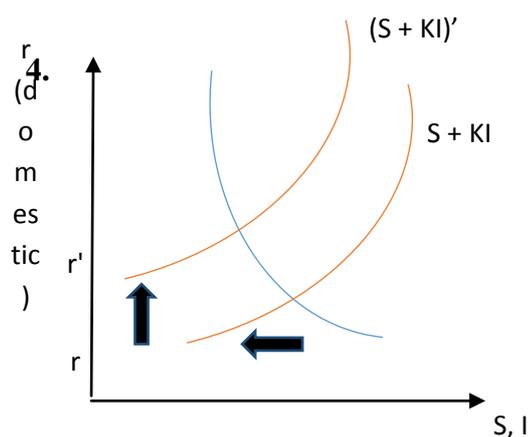
Chapter 26: International Trade and Capital Flows

Review questions

1. For example, suppose that a US citizen buys a \$1,000 TV set imported from China. The US citizen pays by check and the Chinese citizens now holds \$1,000 in an account in a US bank. With this money the Chinese citizen can either purchase US-produced goods or services, or he can acquire US assets such as government bonds.

2. The consumption possibilities curve shows the amount of goods and services a country's citizens can afford to consume. A production possibilities curve shows the quantities of goods and services a country can produce. In the case of a closed economy, the country's consumption possibilities cannot exceed its production possibilities. In the case of an open economy, the country's consumption possibilities exceed its production possibilities.

3. False, it hurts domestic producers of an imported good, but it benefits domestic consumers of the imported good. This is so, because if goods are imported this means that the country is selling its goods at a price above the world price, so the imported goods are cheaper than the domestically-produced goods. This means that people will be able to buy the cheaper imported goods and domestic producers will suffer losses.



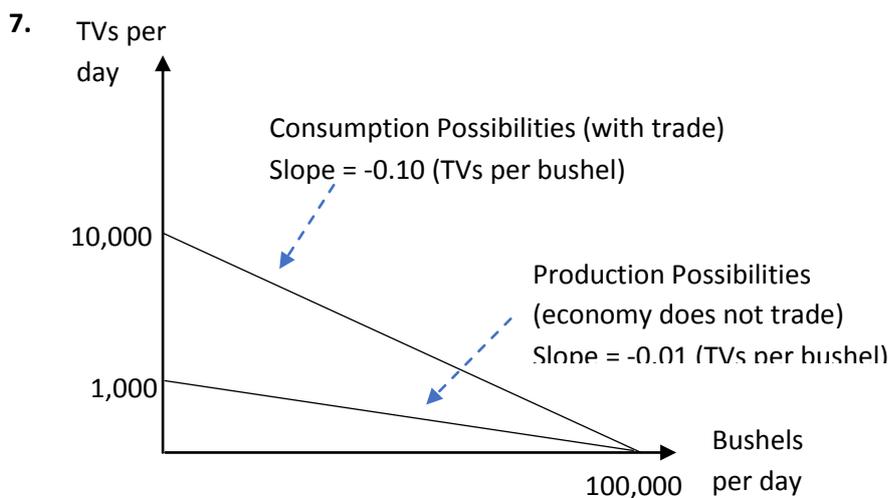
Saving and investment

A politically unstable country will be a risk for foreign investors, so its capital inflows will decrease, the interest rate will rise, and investment in new capital goods will decline.

5. A higher level of capital inflows will provide a country with a larger quantity of total saving, which implies a lower interest rate and a higher level of investment in new capital goods, so capital inflows and domestic investment in new capital goods are positively related.

Problems

1. The maximum number of television sets this country can produce each year is 2,400. The maximum number of refrigerators it can produce per year is also 2,400.
2. If both TV sets and refrigerators cost \$500 in the world market, the maximum number of refrigerators the country can consume each year is 3,200. The maximum number of TV sets it can consume at that price is also 3,200. Changing the prices of TV sets and refrigerators will not change the maximum quantities of the two goods that can be consumed, because they still cost the same.
3. It is possible for the country to consume 1,000 TV sets and 2,200 refrigerators, if both sell for \$1,000 at the world market. This can be achieved by producing 1,600 units of each good, and then selling 600 TV sets for \$1,000 and afterwards buying 600 refrigerators for \$1,000. However, it is not possible for the country to consume 1,000 television sets and 2,500 refrigerators. This is so, because if it produces 1,600 units of each good, and then sells 600 TV sets, the maximum amount of refrigerators it will be able to buy with the money earned from selling the TV sets is 600, which will make the total, and maximum number of refrigerators, with can be consumed together with 1,000 TV sets, equal to 2,200, and not 2,500.
4. If refrigerators and television sets both sell for \$1,000 in the world market, the country should produce at point G – a combination of 1,600 refrigerators and 1,600 television sets. This way it will maximize its consumption possibilities.
5. If the world price of refrigerators rose to \$1,200 and the price of television sets remained \$1,000, the country will start producing more refrigerators at the cost of making fewer television sets. At the same time, the fact that the price of television sets is now lower relative to that of refrigerators means that the country will probably buy more television sets and less refrigerators.
6. If the country is equally productive in making coffee and making tea, and coffee brings it a 20% higher profit, it will be best for it to produce only tea and then supply the amount of tea demanded by its citizens by trading each kg of coffee for 1.20 kg of tea.



- a. The slope shows that the opportunity cost of producing a bushel of corn for the developing economy is equal to 0.01 (or one hundredth) of a TV set. The slope is constant, meaning that this cost does not change with the number of units produced. If the economy does not trade, it can only

consume what it has produced, so its consumption possibilities coincide with its production possibilities.

b. The industrial economy has a higher opportunity cost of producing bushels (the slope of the line is equal to -0.10), meaning that the developing economy has a comparative advantage in producing corn. What the developing economy could do is produce only corn and trade ten bushels of it for a TV. This way, instead of 1,000, the maximum number of TV's it will be able to consume becomes 100,000. Thus, by trading with the industrialized economy, the developing country improved to a great extent its consumption possibilities. This finding is can also be seen in the graph above.

8. a. After Egypt opens trade with the rest of the world, an Egyptian worker can consume a maximum of 10 robots per year, or a maximum of 5,000 pairs of shoes per year. (We get this number by assuming that a produces only robots and sells them at the world price of \$5,000. This way a worker would dispose of \$50,000, with which he would be able to buy 5,000 pairs of shoes at the world price of \$10.)

b. A foreign worker in the shoe industry can produce 500 pairs of shoes, which sell at \$10 per pair, meaning that his yearly wage is equal to \$5,000. A foreign worker in the robot industry can produce one robot, which sells at \$5,000, meaning that his wage is also equal to \$5,000.

c. To answer this question, we must see in which good Egypt has a comparative advantage, that is, in the production of which good it has a lower opportunity cost compared with the rest of the world. The opportunity cost of producing a robot in Egypt is $1,000/10 = 100$ pairs of shoes. Abroad, the opportunity cost of a robot is $500/1 = 500$ pairs of shoes. Thus, Egypt has a lower opportunity cost in manufacturing robots, meaning that it has a comparative advantage in this activity. We can conclude that Egypt will produce and export robots, and import shoes.

d. Above we established that after opening trade, Egyptian workers will specialize in making robots. The wage of an Egyptian worker is now equal to $10 * \$5,000 = \$50,000$. In terms of real income, an Egyptian worker can now buy $\$50,000/\$10 = 500$ pairs of shoes, and $\$50,000/\$5,000 = 10$ robots. Before opening trade, Egyptian workers earned \$30,000 per year. In real terms, a worker could buy $\$30,000/\$30 = 100$ pairs of shoes, and $\$30,000/\$3,000 = 10$ robots. Thus, in terms of purchasing power an Egyptian worker can buy five times more shoes and the same number of robots after opening trade.

e. Egyptian workers are not being hurt by trading in goods produced by 'cheap foreign labor'. After opening doors on trade, an Egyptian worker can choose between consuming the same number of robots or five times more shoes than before. Thus, even though Egyptian workers are trading with people who make ten times less than them, they are benefiting from the situation in terms of increased consumption possibilities.

f. If it is costly for workers to change industries, it might not be as easy for Egypt to start specializing solely in robots right away. A helpful policy might be to provide robot-making training to workers in the shoe industry in order to provide them with an easier and faster transition.

9. a. (1) trade surplus; (2) capital outflow

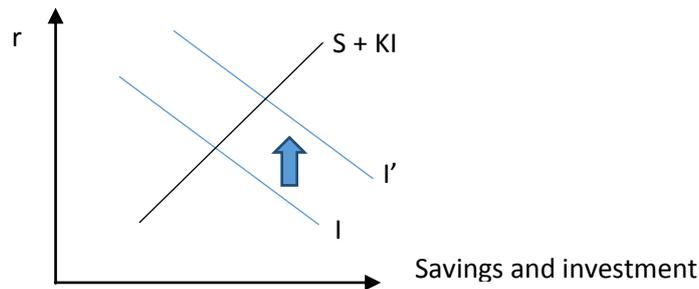
b. (1) trade deficit; (2) capital inflow

c. (1) trade deficit; (2) capital inflow

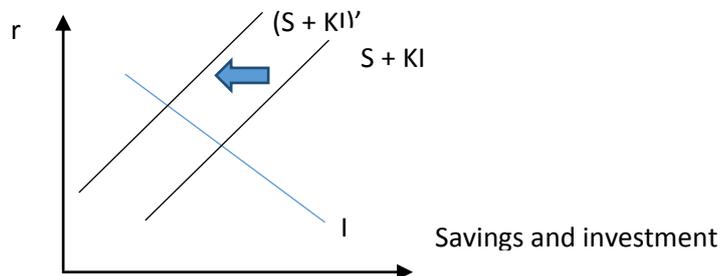
d. (1) trade deficit; (2) capital inflow

e. No change in net exports and no change in capital inflows. Note that the bank is based in Istanbul and that the shares purchased are stock of a Turkish company, so there is no foreign trade of any sort happening.

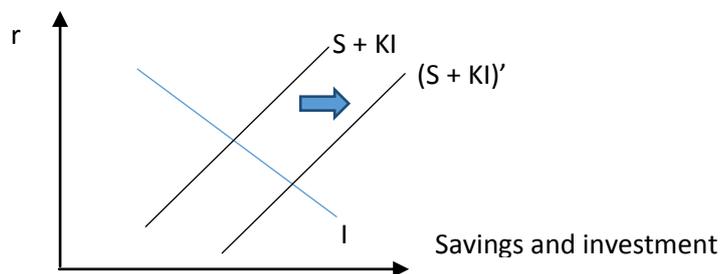
10. a. The improvement in investment opportunities in the country will increase investment, shifting the investment curve upward and to the right. As a result, the interest rate will increase and the level of savings and capital investment will also rise.



b. As a result of the increased government budget deficit, government savings will fall, which will reduce the level of national savings. As a result, the savings and investment curve will shift upward and to the left. Following the shift, the economy will be at a higher level of the real interest rate, and at a lower level of investment, and savings and capital investment.

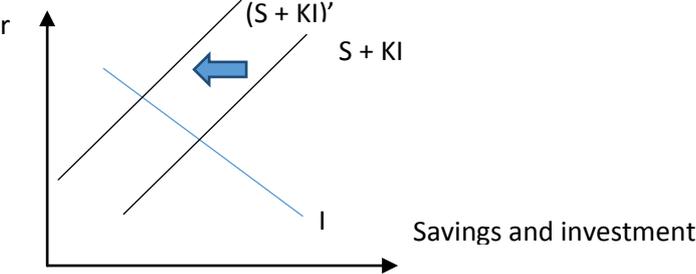


c. This decision of domestic citizens will increase national savings as a whole, so the savings curve will shift downward and the right. As a result, the interest rate will fall, and investment and capital inflows will rise.



d. on next page

d. If investors start to perceive the country as more risky, capital inflows will fall and the savings and investment curve will shift upward and to the left. The interest rate will rise as a result.



References

The problems solved above are taken from the book Principles in Economics. Middle East Edition written by Robert H Frank, Ben S Bernanke and Jay J Squally.

Principles in Economics. Middle East Edition was published by McGraw-Hill Education in 2012.