The Economics of Health and Health Care

Seventh Edition

Instructor's Answers

Chapter 1 - Introduction

3. From 1960 to 1980, Spain's share increased from 1.5% to 5.3%, an increase of 253%, the largest percentage increase. Canada's share increased from 5.4% to 7.0%, an increase of 30%, the smallest percentage increase.

From 1980 to 2009, Korea's share increased from 3.4% to 6.9%, an increase of 102.9%, the largest percentage increase. Sweden's share (from 1980 to 2009) increased from 8.9% to 10.0%, an increase of 12.4%, the smallest percentage increase.

5. From 1960 to 2009, the CPI grew from 82.4 to 214.5 or by 160.3%. From 1980 to 2009, the Hospital and Related Services index grew from 69.2 to 567.9 or by 720.7%. From 1960 to 2006 the Physician Services index grew from 76.5 to 320.8 or by 319.3%.

6. From 1970 to 2009, Private Health Insurance grew by a multiple of 50.87 or 4,987%; Medicare by 64.56 or 6,356% ; and Medicaid by 69.14 or 6,814%.

Chapter 2 - Microeconomic Tools for Health Economics

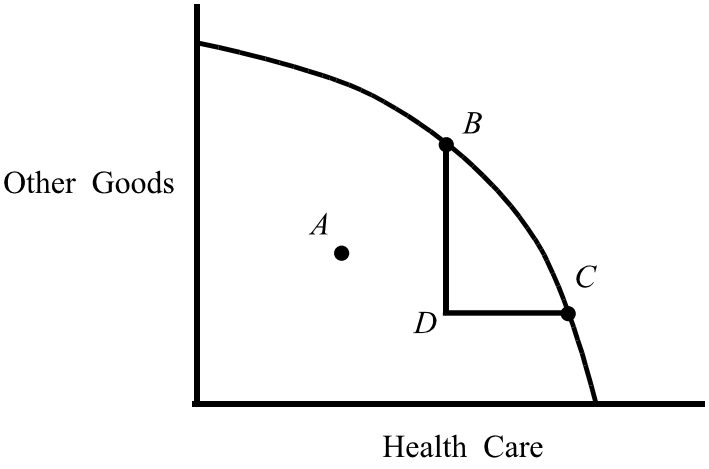
1. An improvement in the technology of producing health would increase the health intercept. An increase in available productive resources would increase both intercepts (i.e. the entire curve would shift outward).

2. Inefficiency will be shown by an interior point (A) in a production-possibility diagram (Figure E2-1).

Two efficient combinations are shown by B and C.

The cost is the decrease in production of other goods (opportunity cost), moving from point B to point C. The amount of other goods given up is shown by BD.

Figure E2-1 - Exercise 2



3. a. Increase in supply leads to lower equilibrium price and higher equilibrium quantity.

b. Same as (a).

c. Decrease in demand leads to lower equilibrium price and lower equilibrium quantity.

d. No effect on equilibrium price and quantity, but if the ceiling price is below the equilibrium price there will be excess demand.

4. a. This curve is linear.

b. This curve is curvilinear.

5. The Food axis (horizontal) shows the maximum quantity of Food if all income is spent on food (i.e. none on health services). The reverse holds for the OG axis (vertical).

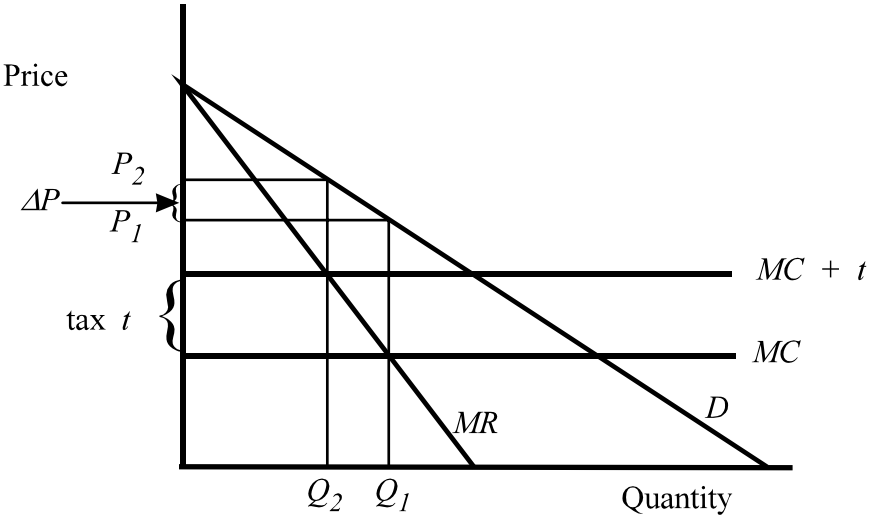
The budget constraint will be unaffected if the income level and both prices double.

6. Elasticity is -1.5 x (300)/1050 = -0.43. The parameter -1.5 is the coefficient of the demand relationship.

7. This problem should refer to the Table 2-5. The slope is -17.2, i.e. the reduction in the amount of capital.

8. As noted in the Figure E2-2, the equilibrium price does not rise by as much as the tax. A firm will move up the MR curve by the amount of the tax, but this does not lead to an equal price increase. With a linear demand, the slope *(ΔP/ΔQ)* of the MR curve is twice the numerical value of the slope of the demand curve. Thus the price increase will be 50% of the tax.

Figure E2.2 - Exercise 8



9. $Q_d = 1810 - 10\,p_s$.

$Q_d = 1910 - 10\,p_s$.

Chapter 3 - Statistical Tools for Health Economics

1. Age 35 or less; mean = 2.39
   Over age 35; mean = 4.83

2. Age 30 or less; mean = 2.00
   Age 30 - 45; mean = 3.14
   Over age 45; mean = 8.25

3. $Q = 5.32 - 0.92P$
   $R^2 = 0.189$

   $Q = 1.54 + 0.08Y$
   $R^2 = 0.095$

   $Q = -2.80 + 0.17A$
   $R^2 = 0.536$

4. $Q = -1.63 - 0.55P + 0.03Y + 0.15A$
   (2.04) (1.01) (5.04)
   $R^2 = 0.620$
   (*t*-statistics in parentheses)

   P and *A* are significant at 5% level; *Y* is not.

Elasticity at means	Mean	Elasticity
Mean *P*	2.116666	-0.332
Mean *Y*	21.75862	0.217
Mean *A*	36.60714	1.592
Mean *Q*	3.48148	

5. Assuming G = 0,

		Elasticity
P	2	-5.86
Y	20	3.57
P_o	3	6.86
Q	1.4	

6.

		Elas (P)	Elas (Y)
Q_a	19	-0.263	0.211
Q_b	29	-0.172	0.138

Elasticities for group (b) are smaller, because 1 unit increase is a smaller pct of a larger amount.

7. If price rises by $1, demand decreases by 3.3.

Initial Q is 350
Percent Change -0.94%

If income rises by $1, demand increases by .001.

Percent Change 0.0003%

8. Good Z is a substitute. An increase in the price of Z leads to an increase in the quantity demanded of X.

We cannot be confident about good X as a normal good, because the income coefficient is statistically insignificant.

9. a. Cigarette consumption decreases as income rises, although the impact does not differ significantly from zero. By this criterion cigarettes are a "necessity" and might be considered as an "inferior good."

b. Multiply the coefficient -0.67 by 3, that is (12 – 9). This indicates that college graduates consume 2.01 cigarettes less than high school graduates.

10. The answer to this question depends critically on what seems to be an outlying, but apparently correct, value for Luxembourg, with a PPP-adjusted income of 91,377 and PPP- adjusted expenditures of 4,808.

Including Luxembourg in the regression gives,

Mean GDP per capita	35248.93
Mean expenditure per capita	3361.356

Regression

Expenditure = 607.2947 + 0.078 * GDP per capita

Elasticity = 0.078 * (35248.93/3361.356) = 0.82

This would show health expenditures as a "necessity," because the elasticity is less than 1.0. An increased income would imply a reduced share.

Excluding Luxembourg,

Mean GDP per capita	33244.35
Mean expenditure per capita	3309.698

Regression

Expenditure = -1483.81 + 0.144 * GDP per capita

Elasticity = 0.144 * (33244.35/3309.65) = 1.45

This would show health expenditures as a luxury, because the elasticity exceeds 1.0, with an increased income implying an increased share.

Instructors can use this example, if they wish to explain to students the importance of outliers.

Chapter 4 – Economic Efficiency and Cost Benefit Analysis

1. At that point, the marginal social cost exceeds the marginal social benefit.

2. Assume that all costs and benefits are incurred at the end of the period.

Project 1

Year	Costs	Benefits	Net@6%	Net@12%
1	5000	2000	-2830.19	-2678.57
2	0	2000	1779.99	1594.39
3	0	2000	1679.24	1423.56
4	0	2000	1584.19	1271.04
5	0	0	0.00	0.00
6	0	0	0.00	0.00
7	0	0	0.00	0.00
8	0	0	0.00	0.00
9	0	0	0.00	0.00
10	0	0	0.00	0.00
Sum			2213.23	1610.41

Project 2

Year	Costs	Benefits	Net@6%	Net@12%
1	5000	0	-4716.98	-4464.29
2	0	0	0.00	0.00
3	0	0	0.00	0.00
4	0	0	0.00	0.00
5	0	0	0.00	0.00
6	0	2000	1409.92	1013.26
7	0	2000	1330.11	904.70
8	0	2000	1254.82	807.77
9	0	2000	1183.80	721.22
10	0	2000	1116.79	643.95
Sum			1578.47	-373.39

Project 1 is preferable in each case.
The project with the later returns is more competitive the lower the discount rate.

3. a. Using the criterion of marginal benefit equaling marginal cost, the efficient level of abatement is 50. The marginal benefit (40) of going from level 50 to level 60, is exceeded by the marginal cost, which is 45.

b. Yes, because total benefits exceed total costs. It is not efficient.

c. Even the total costs exceed the total benefits. Moreover, any level above 50% is not economically efficient.

4. Project

Year	Costs	Benefits	Net@6%	Net@5%	Net@ 4%
0	10000	0	-10000.00	-10000.00	-10000.00
1	0	4000	3773.58	3809.52	3846.15
2	0	3500	3114.99	3174.60	3235.95
3	0	3500	2938.67	3023.43	3111.49
Sum			-172.76	7.56	193.59

Not approved at 6% discount rate.
Approved at 5% discount rate.
Approved at 4% discount rate.

5. Average Cost/Cancer

Stage 1 - $2,000
Stage 2 - $2,476
Stage 3 - $2,830

Marginal Cost/Cancer

Stage 1 - $2,000
Stage 2 - $12,000
Stage 3 - $40,000

Stage 1 is the optimal level of screening.

6.

a. $1000
b. $600
c. $750
d. $400
e. $1150

7.

a. CS = ½ x 15 x 100 = 750; PS = ½ x 8 x 100 = 400; Total surplus = 1150

b. You're looking at the loss of CS. If Q is limited to 90, the WTP (inverse demand) is 11.5 (90% of the linear distance between 25 and 10). So, the loss of surplus is ½ x (11.5 - 10) x 10 = 7.5. CS falls from 750 to 742.5.

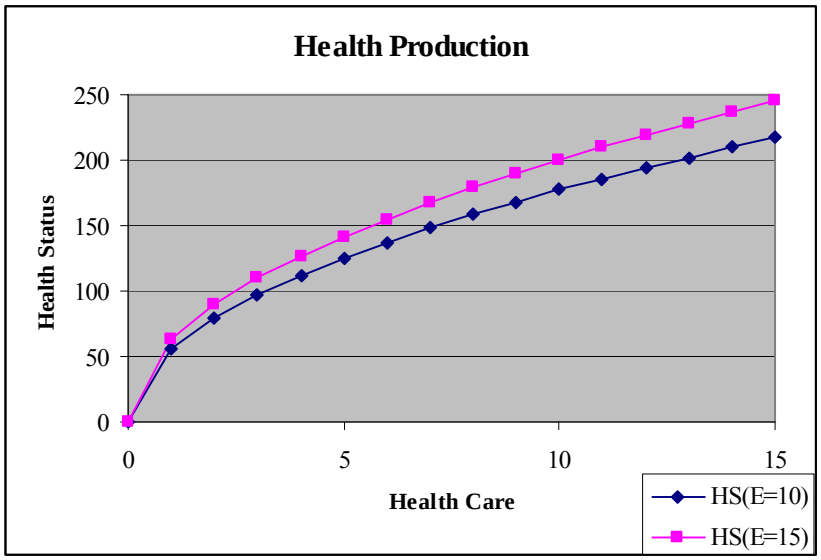
Total loss in surplus includes loss of PS as well. Loss of PS (calculated similarly) is ½ x (10-9.2) x 10 = 4, so PS falls from 400 to 396.

Total surplus falls from 1150 to 1138.5.

Chapter 5 - The Production of Health

1.

E=10			E=15		
HC	HS	MP	HC	HS	MP
0	0.000		0	0.000	
1	56.054	56.054	1	63.305	63.305
2	79.273	23.218	2	89.526	26.222
3	97.089	17.816	3	109.647	20.121
4	112.108	15.020	4	126.609	16.962
5	125.341	13.233	5	141.553	14.944
6	137.304	11.963	6	155.064	13.511
7	148.305	11.001	7	167.488	12.424
8	158.545	10.240	8	179.052	11.564
9	168.162	9.617	9	189.914	10.861
10	177.259	9.096	10	200.187	10.273
11	185.911	8.652	11	209.957	9.771
12	194.177	8.267	12	219.293	9.336
13	202.106	7.929	13	228.248	8.954
14	209.735	7.629	14	236.864	8.616
15	217.097	7.361	15	245.178	8.314

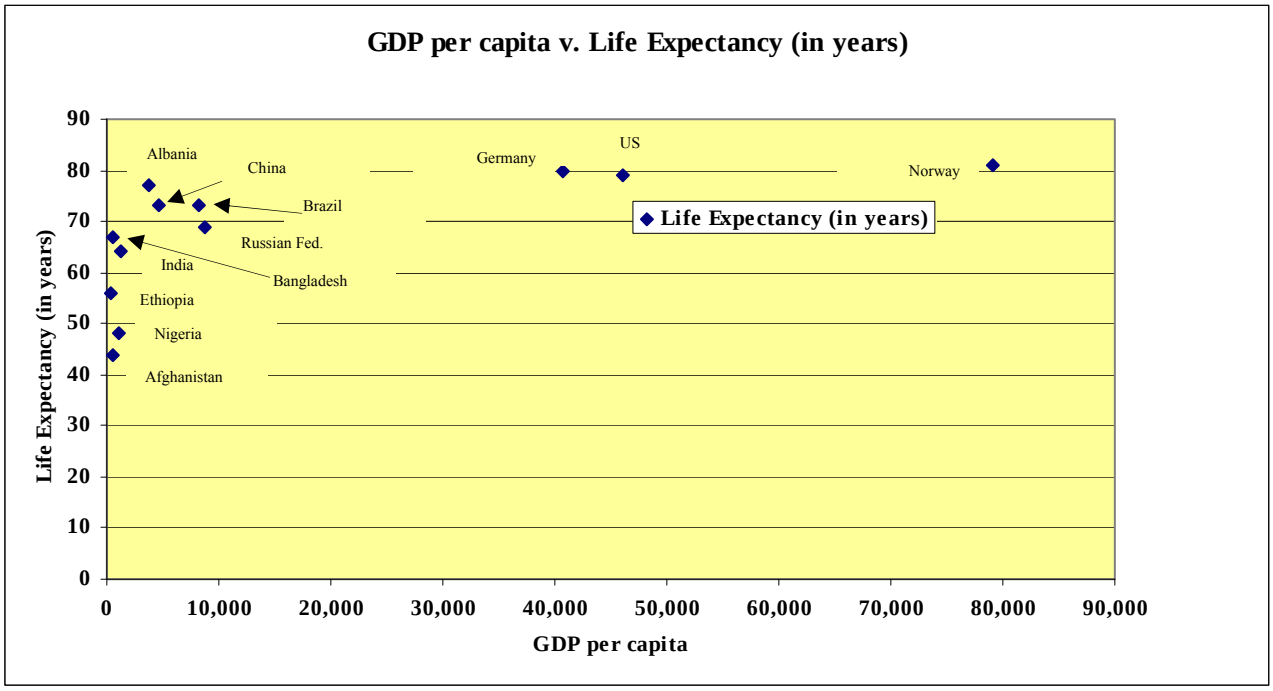


2. For blacks, every factor except BCHS.

For whites, WIC, abortion, and prenatal care.

These may reflect lower incomes and educations.

5. The plot confirms the Prichett and Summers finding.



Chapter 6 - The Production and Cost of Health Care

1. Figure E6-1 shows a family of isoquants with varying elasticities of substitution.

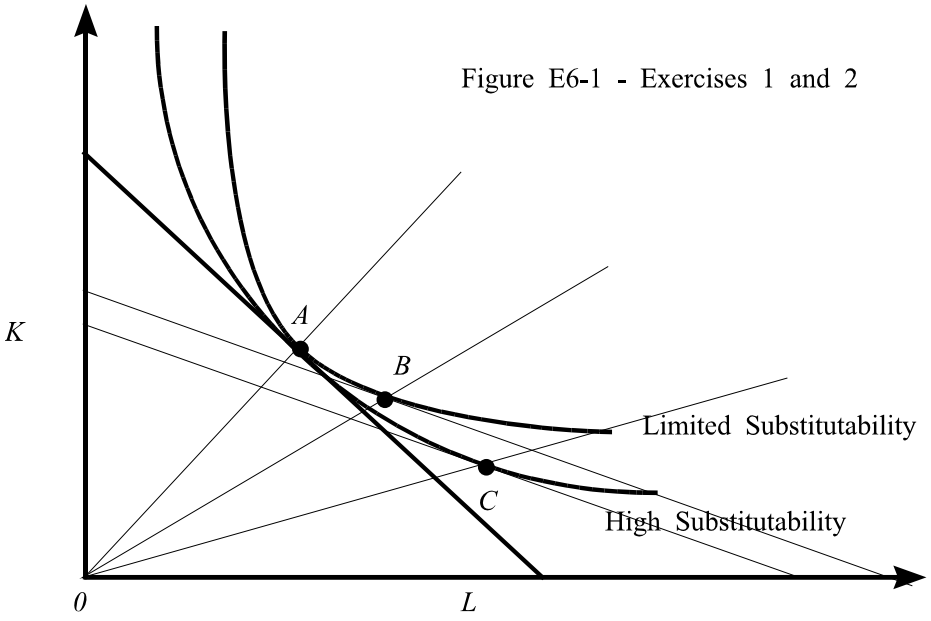


Figure E6-1 - Exercises 1 and 2

2. In Figure E5-1:

Slope of *0A* = initial *K/L* ratio for both.
Slope of *0B* = new *K/L* ratio with limited substitutability
Slope of *0C* = new *K/L* ratio with high substitutability.

The isoquant with the higher substitutability shows a greater change in the *K/L* ratio, and hence it has a higher elasticity of substitution.

3. Elasticity of substitution is zero.

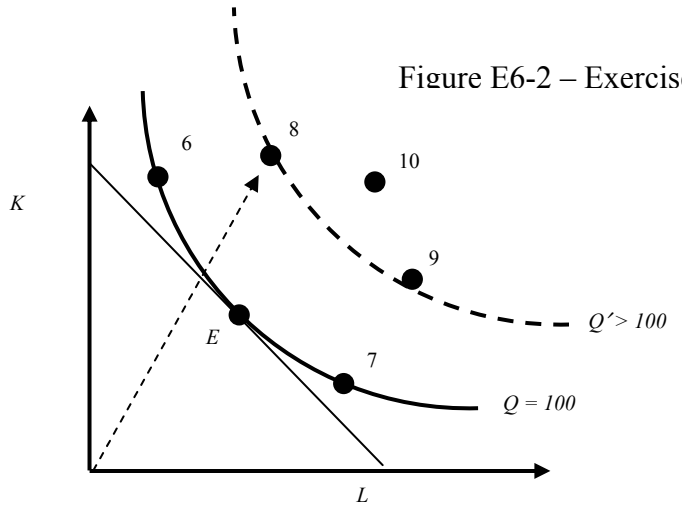
4. a. Constant returns to scale. Costs/unit of output are constant.

b. Increasing returns to scale. Costs/unit of output decrease.

c. Yes, because the costs of producing goods 1 and 2 jointly are less than the costs of producing goods 1 and 2 individually.

5. Nothing will happen to the expansion path because the slopes of the isocost curves do not change. The average cost curve will double.

Figure E6-2 – Exercise 6



6. Examine, for example, point 8. Input reduction distances would be the distance (dashed) along a ray to the efficient isoquant (Q = 100). Output distance would be the measure of output available with the given amounts of labor and capital under efficient production (dashed isoquant at Q′ > 100).

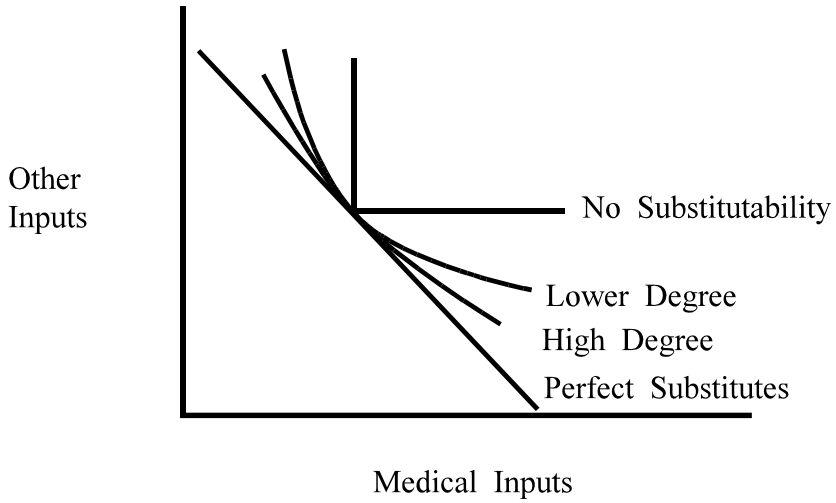
7. Increased communication does not necessarily imply adoption. Communication may encourage or discourage innovation. The key issue is whether the innovation is more profitable more efficient, or more acceptable to the provider's professional image.

8. We derive the average costs by measuring the slopes of rays from the origin to the total cost curve. These rays decrease in slope(increasing returns to scale) up to Q of approximately 125, and then increase in slope (decreasing returns to scale) as Q increases above 125.

Chapter 7 - Demand for Health Capital

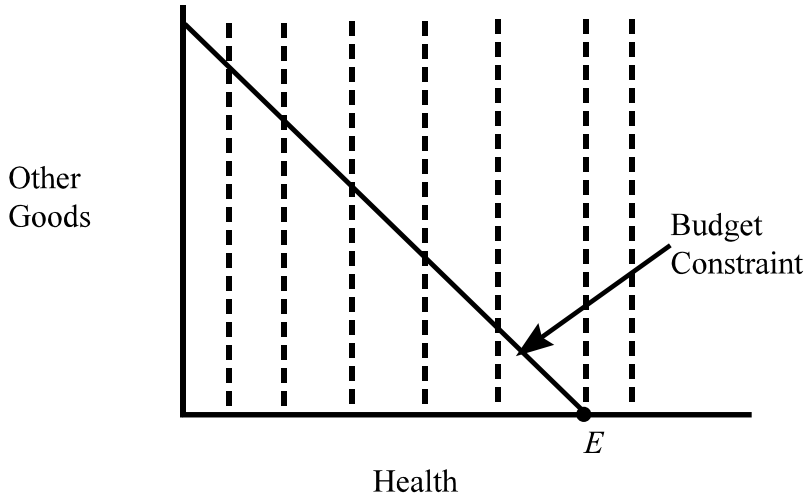
1. Figure E7-1 shows the limiting cases of perfect substitution (negatively sloped straight line) and no substitution (right angle).

Figure E7-1 – Exercise 1

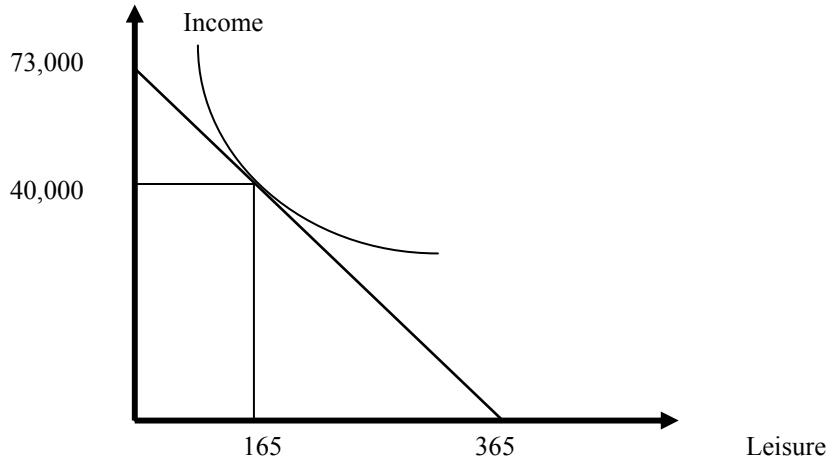


2. Figure E7-2 shows how the individual would spend all of his or her income on health (that is, a corner solution at E).

Figure E7-2 – Exercise 2



3. Refer to Figure 7-65 (text), with an increase in demand, due to higher wage. The cost of capital must be lowered due to the decreased depreciation rate.



4. We have a straight line, with the X intercept of 365 and the Y intercept of 73000. The slope is -200.

5. Indifference curve is tangent at Leisure = 165, income = 40000.

6. Vertical intercept increases to 76650. The equilibrium will show both increased leisure and increased income, although these depend on the shapes of the indifference curves. Instructors may with to address income and substitution effects.

7. This shifts the leisure-income possibilities curve in. The X-axis is now 355 and the Y intercept is 71000. It is likely that both leisure and income will fall, although these again will depend on the shapes of the indifference curves.

8. a. Referring to Figure 7-6 (text), the optimal health stock will rise with an increase in wage rate. Her increased education would also increase the demand for health capital.

b. Again referring to Figure 7-6 (text) we see an outward shift in the MEI curve. Increased education also shifts out the MEI curve.

c. With the increase in the cost of capital, the optimal stock decreases.

9. a. Components of capital costs are forgone interest, depreciation. One gives them up to get capital.

b. $I^* = 500 - 1000 \times 0.10 = 400$.

Equilibrium expenditure = $400 \times 0.10 = 40$.

c. Equilibrium level of health investment falls to 300. Equilibrium health expenditures will rise from 40 to 60, because the MEI is seen to be inelastic.