B.E. International Program
Faculty of Economics, Thammasat University

EE 474 Health Economics

Semester 1/2014

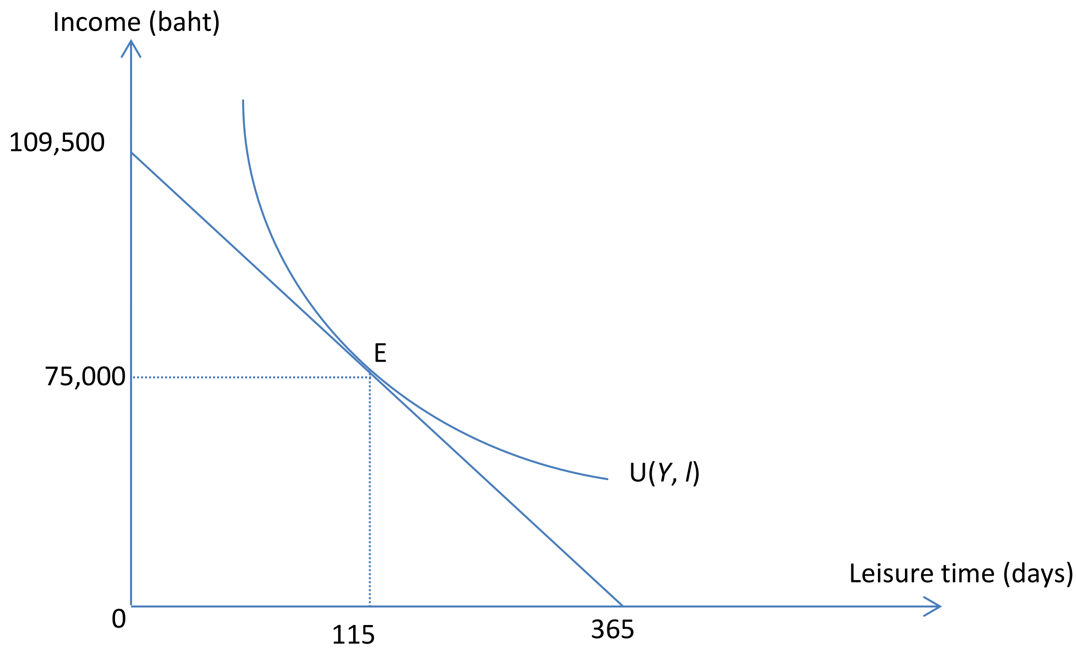
Problem Set 1-Suggested Answers

Due 2 October 2014 (In Class)

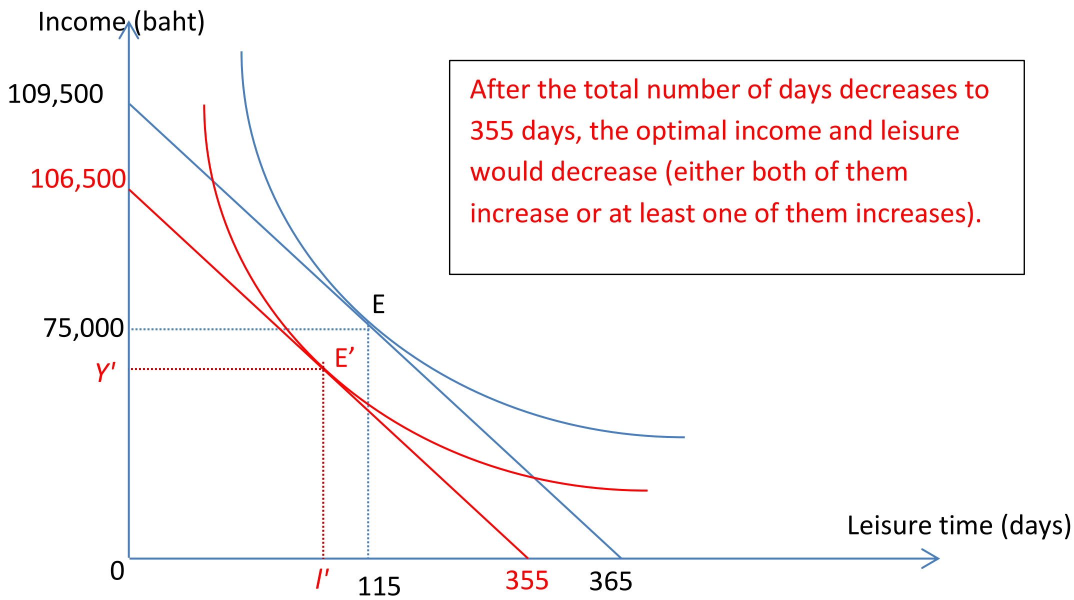
There are four questions in total. Each of them is worth 10 points.

1. Suppose that Chompoo could work 365 days per year and could earn 300 baht per day for each day she worked. When she is healthy, she chooses to work 250 days per year.

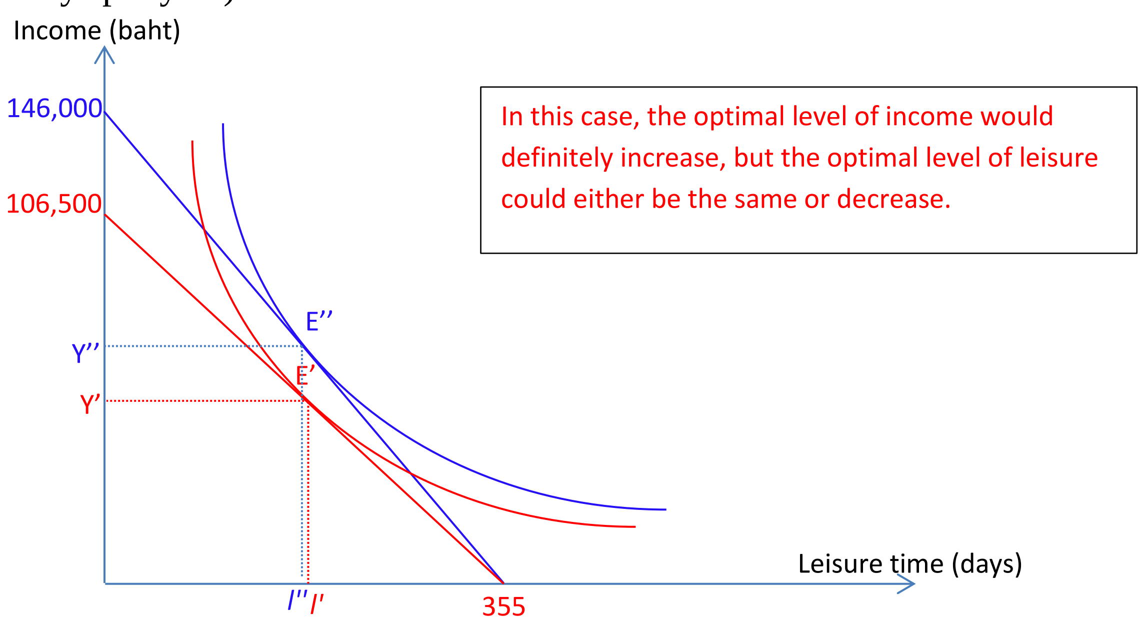
   a. (2 points) Draw a diagram to illustrate the trade-off between income and leisure when Chompoo is healthy.



b. (4 points) Suppose now that Chompoo is ill 10 days per year. Draw a diagram to illustrate the impact of her illness on the new equilibrium shown in part a. How will it change her equilibrium level of income and leisure?



c. (4 points) Suppose that Chompoo gets a promotion and her wage increases to $400 per day. Draw a diagram to illustrate how her equilibrium levels of income and leisure will change after her wage increases. Assume that everything else remains constant (i.e. she is ill 10 days per year).



2. Suppose that when the price of a health care service is $20 per visit, Ken chooses to make 10 visits per year. If the price of this service increases to $30 per visit, he chooses to make 9 visits per year.

   a. (4 points) Calculate the *money* price elasticity of this health care service.

Ans. $\varepsilon_m = \frac{\%\Delta Q}{\%\Delta P} = \frac{(9-10)/9.5}{(30-20)/25} = -0.26$

   b. (4 points) Suppose that Ken earns $20 per hour and each visit takes 1.5 hours of his time. Calculate the time costs of a visit, and compute the *full* price elasticity of this service. (Suppose there is no transportation cost at all.)

Ans.
$P_{F1} = P_{m1} + P_T = \$20 + \$20*1.5 = \$50$
$P_{F2} = P_{m2} + P_T = \$30 + \$20*1.5 = \$60$

$$\varepsilon_F = \frac{\%\Delta Q}{\%\Delta P} = \frac{(9-10)/9.5}{(60-50)/55} = -0.58$$

   c. (2 points) Compare the two elasticities found in parts a. and b., and discuss the difference between the two numbers.

Ans. $|\varepsilon_F| > |\varepsilon_m|$ ➔ When taking into account the time cost, the demand for health care visit is more responsive to the price change.

3. Suppose that a health care service is produced by using two labor inputs: registered nurses and technical nurses. The wage rates for registered nurses and technical nurses are 50,000 and 40,000 baht per month, respectively. At these wage rates, the hospital hires 80 registered nurses and 100 technical nurses.

   a. (5 points) Suppose that the wage rate for registered nurses increases to 54,000 baht per month, while the wage rate for technical nurses remains constant. With the new wage rate, the hospital reduces the number of registered nurses by 5 and increases the number of technical nurses by 5, in order to maintain the *same level of output*. Calculate the elasticity of substitution between the two types of nurses.

Ans. $\varepsilon_S = \frac{\%\Delta(\frac{RN}{TN})}{\%\Delta\left(\frac{W_{RN}}{W_{TN}}\right)} = \frac{\left(\frac{75}{105}-\frac{80}{100}\right)/\frac{80}{100}}{\left(\frac{54000}{40000}-\frac{50000}{40000}\right)/\frac{50000}{40000}} = -1.34$

Alternatively,

$$\varepsilon_S = \frac{\%\Delta(\frac{TN}{RN})}{\%\Delta\left(\frac{W_{TN}}{W_{RN}}\right)} = \frac{\left(\frac{105}{75}-\frac{100}{80}\right)/\frac{100}{80}}{\left(\frac{40000}{54000}-\frac{40000}{50000}\right)/\frac{40000}{50000}} = -1.62$$

b. (5 points) Suppose now that the wage rate for registered nurses increases to 55,000 baht per month, and the hospital would like to keep hiring all registered nurses and technical nurses at the same levels as in part a. (i.e. 75 registered nurses and 105 technical nurses). If both the output level and the elasticity of substitution between the two types of nurses remain the same, should the hospital increase or reduce the wage rate for technical nurses, and by how much?

Ans. $\varepsilon_S = \frac{\%\Delta(\frac{RN}{TN})}{\%\Delta\left(\frac{W_{RN}}{W_{TN}}\right)} = \frac{\left(\frac{75}{105}-\frac{80}{100}\right)/\frac{80}{100}}{\left(\frac{55000}{W_{TN}}-\frac{50000}{40000}\right)/\frac{50000}{40000}} = -1.34$ ➔ $w'_{TN} = 40{,}740.74.$

Note: If you understood that the "before" wage rate for registered nurse was 54,000, then the answer would be:

$\varepsilon_S = \frac{\%\Delta(\frac{RN}{TN})}{\%\Delta\left(\frac{W_{RN}}{W_{TN}}\right)} = \frac{\left(\frac{75}{105}-\frac{80}{100}\right)/\frac{80}{100}}{\left(\frac{55000}{W_{TN}}-\frac{54000}{40000}\right)/\frac{54000}{40000}} = -1.34$ ➔ $w'_{TN} = 37{,}722.91.$

This answer is ok as well.

4. Suppose Mark is a risk-averse person. His wealth is $50,000 (with utility of 300) when he is healthy, and if he becomes ill (with the probability = 0.15), his health care expenses will cause his wealth to decline to $35,000 (with utility of 200).

   a. (4 points) Derive his expected wealth and expected utility when he is *not insured*.

   Ans. E(W) = (0.15*$35,000) + (0.85*$50,000) = $47,750

   E(U) = (0.15*300) + (0.85*200) = 285 utils

b. (6 points) Use a diagram to illustrate *welfare gain in utility terms* if Mark purchases an actuarially fair insurance policy.

Ans. AFP = 0.15*(50,000-35000) = $2,250