# CHAPTER 2
# Utility and Choice

## *A. Summary*

Chapter 2 introduces many new concepts to the student and for that reason it is one of the more difficult chapters in the text. The central concept of the chapter is the indifference curve and its slope, the Marginal Rate of Substitution (MRS). The MRS formalizes the notion of trade-off and is (in principle) measurable. For those reasons it is superior to a "marginal utility" introduction to consumer theory. The definition provided for the MRS in Chapter 2 needs to be approached carefully. Here the concept is defined as the Marginal Rate of Substitution of "X for Y" by which is meant X is being substituted for Y. In graphic terms the individual is moving counter-clockwise along an indifference curve and the MRS measures how much Y will be willingly given up if one more X becomes available. The pedagogic convention of always using counter-clockwise movements along an indifference curve is helpful because the MRS does indeed diminish for movements in that direction.

For some reason, students' primary difficulty with the material in Chapter 2 is in confusing the MRS (a slope concept) with the *ratio* of the amounts of two goods. Unfortunately, that confusion is increased by some examples based on the Cobb-Douglas utility function, which make it appear that the two concepts are interchangeable. To avoid this confusion, some instructors may wish to give further emphasis to the marginal utility definition of MRS, which is presented in footnote 2 of the chapter. This might be followed by greater use of the utility maximization principle (the "equi-marginal principle") from footnote 5.

The soft drink-hamburger example that runs throughout Chapter 2 is intended to provide an easy, mildly amusing introduction to the subject for students. In general, the example seems to work well and is, we believe, definitely superior to introducing the concepts through general goods X and Y. Note also that this chapter includes analyses of 4 specific kinds of goods (useless goods, economic bads, perfect substitutes, and perfect complements). Examining the utility maximizing conditions in these cases (Figures 2-5 and 2-9) should help students to visualize what the conditions mean in cases where the results should be obvious.

## *B. Lecture and Discussion Suggestions*

The challenge in lecturing on Chapter 2 is to avoid mere repetition of the text. One way to do that is to offer a somewhat more mathematical treatment. The use of calculus involved in such a treatment may, however, prove too difficult for students to grasp, especially if it involves introducing the Lagrangian technique. An alternative approach would be to start from one point in the X-Y plane and ask how an indifference curve might look. Proceeding from one point to the next in this way reinforces the concept of the trade-off and (on a more sophisticated level) demonstrates Samuelson's integrability problems. Once a single indifference curve has been traced out, a second can be constructed to the northeast of the first by using the "more is better" assumption and proceeding with an identical construction. Utility maximization can be approached in the same way by starting at the Y-intercept on the budget constraint and inquiring whether the individual would make various trades along the constraint.

Discussions of Chapter 2 material might focus on real world illustrations of both economic and non-economic choices that people make. To approach these, students might be asked to theorize what budget constraint faces people in unusual situations (e.g., what is the cost of shopping for bargains or for wearing seat belts). The instructor can then ask whether there is evidence that individuals respond to changes in the relative costs associated with such activities (that is, do they search more for bargains in high priced items, or are certain types of people less likely to wear seatbelts). Application 2.6 *Loyalty Programs* also offers a number of discussion possibilities that would help to illustrate the actual shape of budget constraints.

### *C. Glossary Entries in the Chapter*

- Budget Constraint
- *Ceteris Paribus* Assumption
- Complete Preferences
- Composite Good
- Indifference Curve
- Indifference Curve Map
- Marginal Rate of Substitution (MRS)
- Theory of Choice
- Transitivity of Preferences
- Utility

## SOLUTIONS TO CHAPTER 2 PROBLEMS

2.1 a. $\dfrac{\$8.00}{\$.40/\text{apple}} =$ 20 apples can be bought.

b. $\dfrac{\$8.00}{\$.10/\text{banana}} =$ 80 bananas can be bought.

c. 10 apples cost:

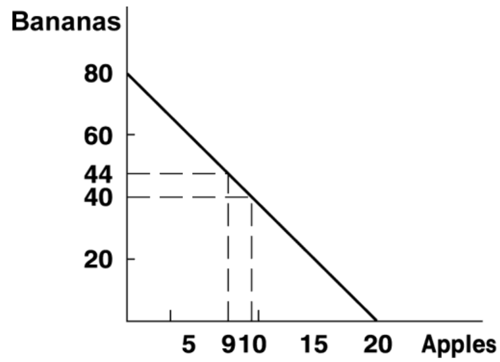
10 apples × \$.40/apple = \$4.00, so there is \$8.00 – \$4.00 = \$4.00 left to spend on bananas which means

$\dfrac{\$4.00}{\$.10/\text{banana}} =$ 40 bananas can be bought.

d. One less apple frees \$.40 to be spent on bananas, so

$\frac{\$.40}{\$.10/\text{banana}}$ = 4 more bananas can be bought.

e. $8.00 = $.40 × number of apples + $.10 × number of bananas = .40$A$ + .10$B$.



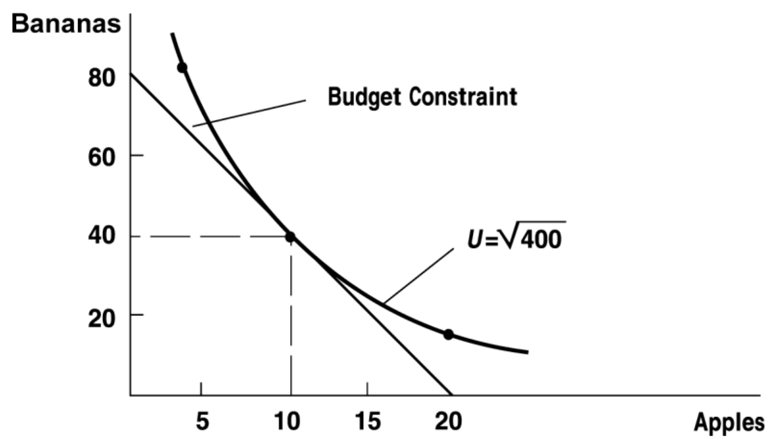

2.2 a. $U = \sqrt{A \bullet B} = \sqrt{5 \bullet 80} = \sqrt{400} = 20.$

b. $U = 20 = \sqrt{10 \cdot B}$ so $400 = 10 \cdot B$,

$40 = B$.

c. $U = 20 = \sqrt{20 \cdot B}$, so $400 = 20 \cdot B$, $20 = B$.

d.




e. From the budget part d, an individual can buy 10 apples and 40 oranges.

f. One less apple: $U = \sqrt{9 \times 44} = \sqrt{396} < \sqrt{400} = 20$

One more apple: $U = \sqrt{11 \times 36} = \sqrt{396} < \sqrt{400}$

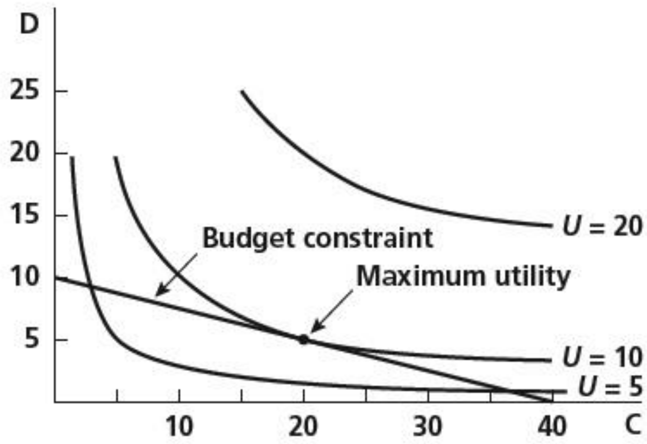
At both endpoints of the budget constraint: $U = 0 = \sqrt{20 \times 0} = \sqrt{0 \times 80}$

Graph shown in d.

2.3 To graph the indifference curves, use $U^2$ instead of $U$.

$U = 10$ means $U^2 = 100 = C \cdot D$. Hence, indifference curves are hyperbolas.

a.




b. See graph.

c. D=10, $U = \sqrt{10 \cdot 0} = 0$

d. If, say, spent half of income on D, half on C, would buy D=5, C=20. Utility would be $U = \sqrt{5 \cdot 20} = 10$ which is less than 20. Trial and error shows that any other budgetary allocation provides even less utility than this.

e. As in part d, Paul can buy 20 C and utility will be 10.

f. Any other allocation yields less utility (see graph).

2.4 a. Tangency is the same in either case.

b. Costs are:

i. \$520

ii. \$290

iii. \$205

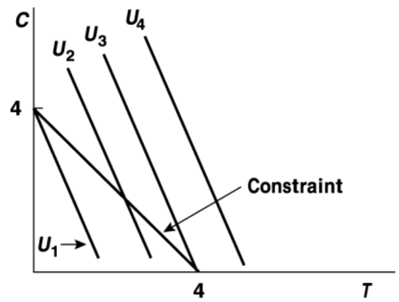
iv. \$200

v. \$250

vi. \$425

c. The bundle *C = 20, D = 5* is the least costly of those that provide utility of 10. This is the same solution as in problem 2.3.

2.5




a. The indifference curves here are straight lines with slope -4/3. Hence, the MRS is a constant 4/3. The goods are perfect substitutes

b. Because one unit of tea provides more utility than a unit of coffee, she will spend all of her income on tea when the prices are equal: *T = 4, C = 0.*

c. The graph shows that the indifference curves are steeper than the budget constraint, so maximum occurs on the *T* axis.

d. With more income she would continue to buy only tea. If coffee prices fall to \$2, coffee is now a cheaper way to obtain utility – one unit of coffee yields 3 units of utility at a cost of \$2 so utility costs \$2/3 per unit of utility. With tea, utility costs \$3/4 per unit of utility.

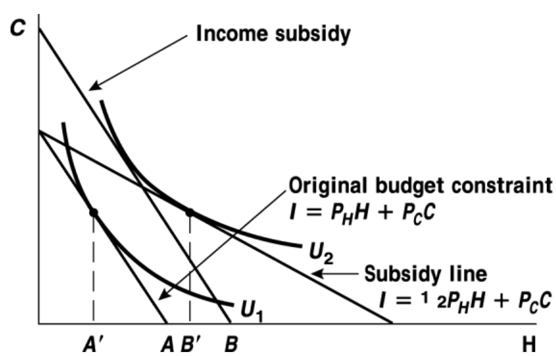
2.6 a. Each meal consists of PB=2, C=1. This costs 4(2)+2(1)=10. With an income of \$100 she can buy 10 meals per month – or PB=20, C=10.

b. Now each meal costs 5(2)+2(1)=12. She can buy 100/12 = 8.33 meals.

c. To restore Vera's ability to buy 10 meals she would need Food Stamps to buy 1.67 meals. These would cost 1.67x12 = 20.

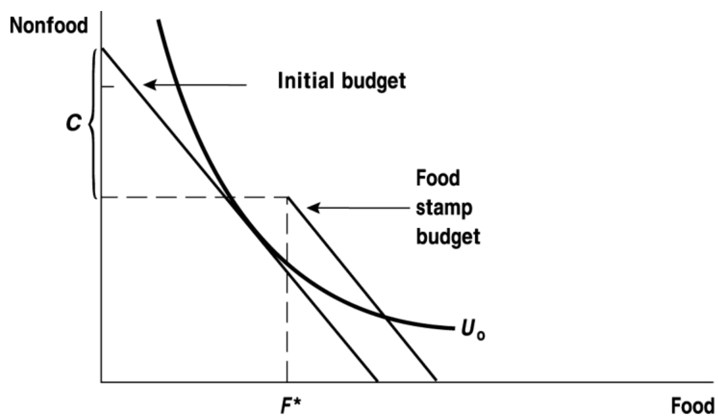
d. These preferences allow no substitution of PB for C in response to changing prices. A graph of this utility function would resemble that shown for Right Shoes and Left Shoes in Figure 2.5d.

2.7



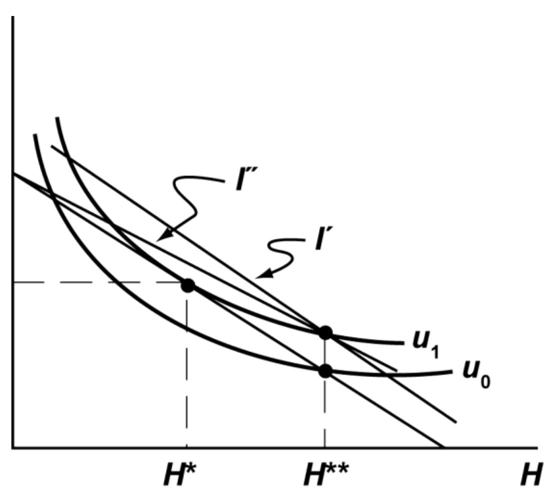
Income subsidy is cheaper since $AB < A'B'$. This result occurs because the housing subsidy encourages people to buy more housing though housing is not really cheaper.

2.8




This person will participate in the Food Stamp program if (as in graph) he or she can reach a utility level higher than $U_0$ by doing so. With cash, the post-transfer constraint would extend the line to the nonfood axis, making it desirable for all to participate.

2.9 a, b.




The figure shows that an unconstrained choice will yield utility level $U_1$ with choices of $C^*$, $H^*$. If the government requires purchase of $H^{**}$, utility would fall to $U_0$. Low-income consumers are most likely to be constrained by $H \geq H^{**}$.

c. To restore this person to $U_1$ would require extra income to shift the budget constraint outward to I'.

d. A housing subsidy would permit this person to reach $U_1$ with budget constraint I''.

2.10

a. In problems 2.2 and 2.3 $\alpha = \beta = 0.5$.

b. Utility maximization requires $P_X / P_Y = MRS = \alpha Y / \beta X = \alpha Y / (1-\alpha) X$. Some algebraic manipulation yields: $(1-\alpha) P_X X = \alpha P_Y Y$. Substituting this into the budget constraint yields: $P_X X + (1-\alpha) P_X X / \alpha = I \text{ or } P_X X = \alpha I$.

c. Because this person spends $\alpha I$ on good X, this amount does not change unless I changes.

d. Because spending on $X$ is given by $\alpha I$, changes in the price of $Y$ will not affect this spending.

e. If Income doubles, spending on both X and Y must double because income is split evenly between the two goods. But prices have not changed, so the quantities of X and Y must double.