

Worksheet 3: One-period model/ Static model

EC-308

October 17, 2022

0.0.1 A note on perfect complement and perfect substitute preferences

Perfect complement preferences

When consumer has perfect complement preferences, she consumes the consumption good and leisure in a fixed proportion. Mathematically, it looks like this:

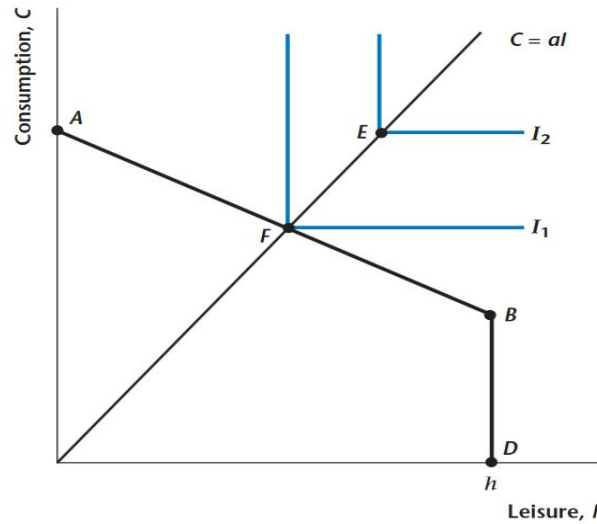
$$\frac{c}{l} = a.$$

This means that the ratio of c to l is constant (a). Multiplying both sides by l , we can re-write the above expression as

$$c = al.$$

When consumer has perfect complement preferences, Indifference curves are L shaped, as in the figure below.

Figure 1: Perfect complement preferences



The consumer's optimal bundle always lies on the line $c = al$, specifically at points F or E . Examples of perfect complement goods could be right shoe and left shoe, coffee and cream etc.

Perfect substitute preferences

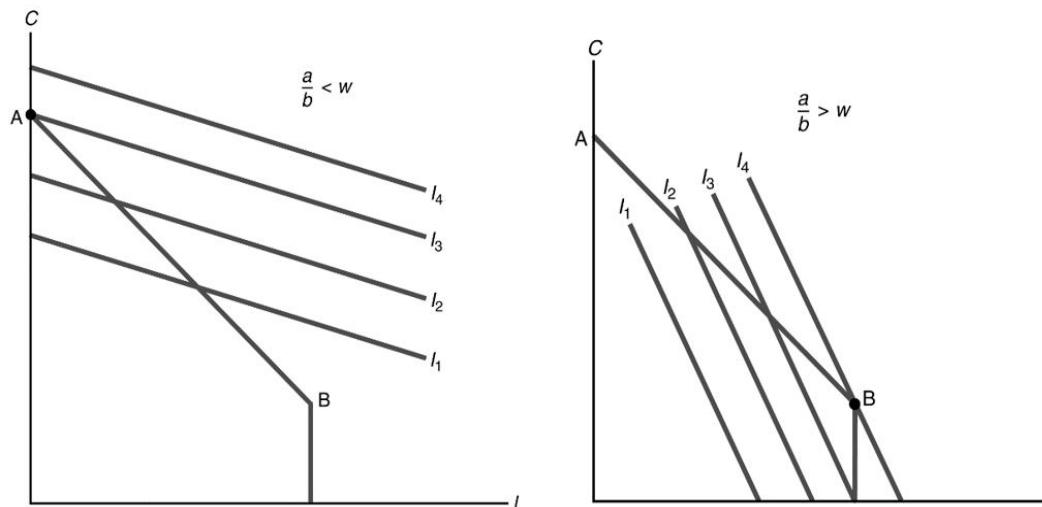
Perfect substitute preferences mean that consumer can consume leisure instead of consumption good or vice versa. While this example sounds strange, better examples of perfect substitute preferences are preference

over red pencil vs blue pencil, or, over brown rice vs pasta, United Airlines vs American Airlines etc. In this case, Indifference curves have this kind of expression:

$$u = al + bc,$$

where a and b are positive constants and u is the utility level. In graph, perfect substitute preferences look like this:

Figure 2: Perfect substitute preferences

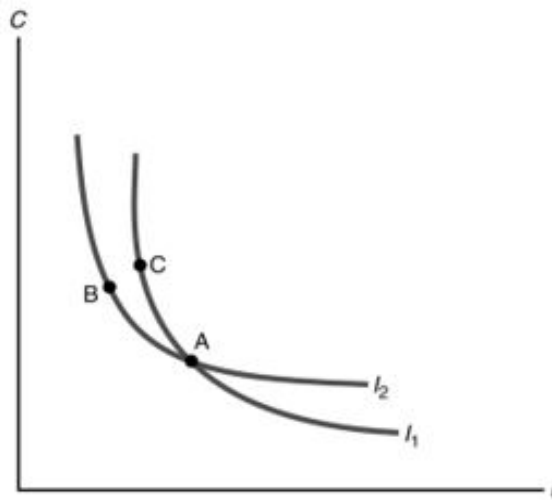


In the figure above, our representative consumer cannot optimize in either case because on the left graph, wage rate w is less than the $MRS_{l,c}$, which is $\frac{a}{b}$. On the graph on right, $MRS_{l,c}$ is higher than wage rate w . This means that the consumer optimizes when Indifference curve and the AB segment of the budget constraint overlap. Why? Because that's when we have $MRS_{l,c} = \frac{a}{b} = w$.

Note that in reality we don't quite see perfect complement or perfect substitutes. There are, however, many cases of gross complements or gross substitutes. The examples I gave above are more of gross complements and gross substitutes.

0.0.2 Can indifference curves cross? Hint: remember what we assumed about consumer's preferences.

Figure 3: Can Indifference curves cross?



0.0.3 Suppose that the government imposes a proportional income tax on the representative consumer's wage income. That is, the consumer's wage income is $w(1-t)(h-l)$ where t is the tax rate. What effect does the income tax have on consumption and labor supply? Explain your results in terms of income and substitution effects.

0.0.4 Suppose that a consumer cannot vary hours of work as he or she chooses. In particular, he or she must choose between working q hours and not working at all, where $q > 0$. Suppose that dividend income is zero, and that the consumer pays a tax T if he or she works, and receives unemployment insurance benefit b when not working.

1. If the wage rate increases, how does this affect the consumer's hours of work? What does this have to say about what we would observe about the behavior of actual consumers when wages change?
2. Suppose that the unemployment insurance benefit increases. How will this affect hours of work? Explain the implications of this for unemployment insurance programs.

0.0.5 Suppose that a consumer can earn a higher wage rate for working overtime. That is, for the first q hours the consumer works, he or she receives a real wage rate of w_1 , and for hours worked more than q he or she receives w_2 , where $w_2 > w_1$. Suppose that the consumer pays no taxes and receives no nonwage income, and he or she is free to choose hours of work.

1. Draw the consumer's budget constraint, and show his or her optimal choice of consumption and leisure.
2. Show that the consumer would never work q hours, or anything very close to q hours. Explain the intuition behind this.
3. Determine what happens if the overtime wage rate w_2 increases. Explain your results in terms of income and substitution effects. You must consider the case of a worker who initially works overtime, and a worker who initially does not work overtime.

0.0.6 Suppose that the government imposes a producer tax. That is, the firm pays t units of consumption goods to the government for each unit of output it produces. Determine the effect of this tax on the firm's demand for labor.