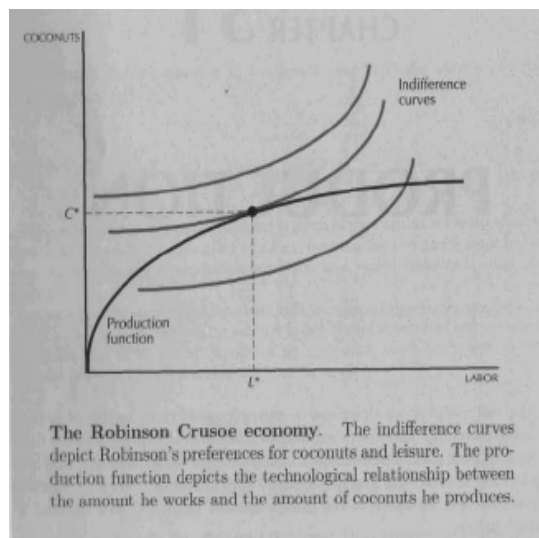# 11 PPF, Comparative Advantages

11.1 The Robinson Crusoe economy

During this analysis Robinson plays two roles: he is both a consumer and a producer. Robinson can either lie on the beach and do nothing, i.e. consume leisure or he can spend time working, gathering coconuts. The more coconuts he gathers the more he has to eat, but the less time he has to relax. Robinson's preferences for leisure and coconuts are depicted on the picture below.

The Robinson Crusoe economy. The indifference curves depict Robinson's preferences for coconuts and leisure. The production function depicts the technological relationship between the amount he works and the amount of coconuts he produces.

We also illustrated typical Robinson's production function that describes the relationship between how much Robinson works and how many coconuts he gets. The more Robinson works the more coconuts he gets but due to diminishing returns to labor the marginal product of labor decreases as the hours of labor increase. How much will Robinson work and how much he will consume? The optimum combination of labor and consumption is a point where the highest indifference curve touches production function. The production function describes Production possibilities frontier (PPF) - maximum possible output for a given level of input(s). The set below this function is production set.

At this point, the slope of the indifference curve must equal the slope of the production function by the standard argument: if they crossed, there would be some other feasible point that was preferred. This means that the marginal product of an extra hour of labor must equal the marginal rate of substitution between leisure and coconuts. If the marginal product were greater than the marginal rate of substitution, it would pay for Robinson to give up a little leisure in order to get the extra coconuts. If the marginal product were less than the marginal rate of substitution, it would pay for Robinson to work a little less.
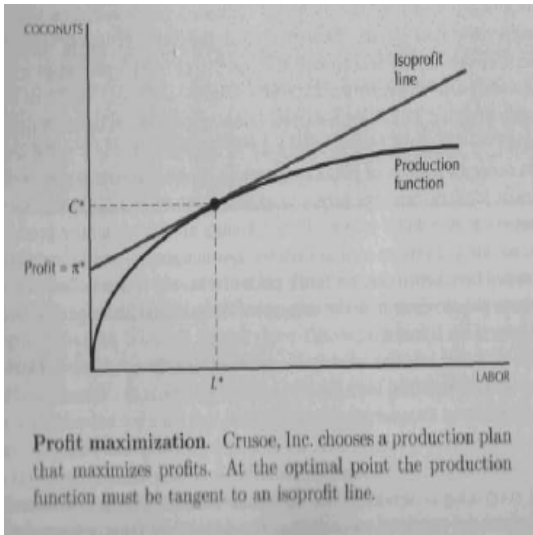
Market approach: Robinson the firm

Each evening, Crusoe decides how much labor it wants to hire the next day, and how many coconuts he wants to produce. Given a price of coconuts of 1 and a wage rate of labor of w, we can solve
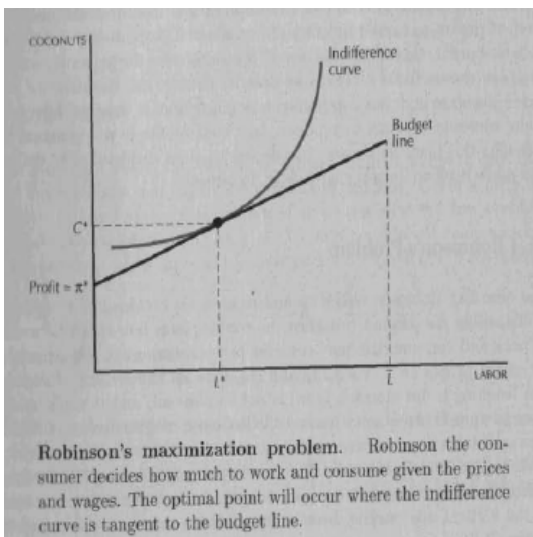
the firm's profit- maximization problem:

$$\max_{C} \pi = C - wL$$

For a given level of profit π, the formula $\pi = C - wL$ or $C = \pi + wL$ describes the isoprofit lines - all combinations of labor and coconuts that yield profits of π. Crusoe will choose a point where the profits are maximized. As usual, this implies a tangency condition: the slope of the production function - the marginal product of labor - must equal w, as illustrated in the picture below.

Profit maximization. Crusoe, Inc. chooses a production plan that maximizes profits. At the optimal point the production function must be tangent to an isoprofit line.
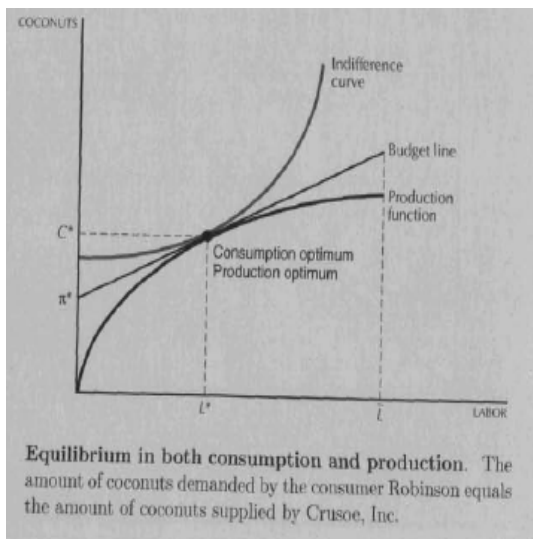
Market approach: Robinson the consumer

The next day Robinson wakes up and receives his dividend of π dollars. While eating his coconut breakfast, he decides how much he wants to work and consume. He may consider just consuming his endowments - spend his profits on π coconuts (the price of coconuts is normalized to 1) and consume his endowment of leisure. But he also might decide to work for a few hours. We can describe Robinson's labor-consumption choice using standard indifference curve analysis. Plotting labor on the horizontal axis and coconuts on the vertical axis, we can draw in an indifference curve as illustrated in the following picture:

Robinson's maximization problem. Robinson the consumer decides how much to work and consume given the prices and wages. The optimal point will occur where the indifference curve is tangent to the budget line.

Note that the indifference curves have a positive slope. This is because coconuts are a good and labor is a "bad". If we indicate the maximum amount of labor by $\overline{L}$, then the distance from $\overline{L}$ to the chosen supply of labor gives Robinson's demand for leisure. Robinson's budget line is also illustrated in the picture above. It has a slope of w and passes through his endowment point $(\pi^*, 0)$ (Robinson has a zero endowment of labor and a π^* endowment of coconuts). At his optimal consumption, the marginal rate of substitution between consumption and leisure must equal the wage rate.

Robinson the consumer meets Robinson the producer

Using the market system (solving separately consumer's and producer's problem) gives exactly the same result as choosing between leisure and consumption directly.

Equilibrium in both consumption and production. The amount of coconuts demanded by the consumer Robinson equals the amount of coconuts supplied by Crusoe, Inc.

Since the marginal rate of substitution between leisure and consumption equals the wage, and the marginal product of labor equals the wage as well, it follows that marginal rate of substitution between leisure and consumption equals the marginal product and hence the slope of indifference curve and production function is the same.

In case on one-person economy using the markets, i.e. dividing the decision onto two parts is unnecessary. However, in economy with many consumers it makes sense - firms and consumers make decisions based on the prices.

Robinson Crusoe Economy helps to illustrate:

- closed economy - no trade

- labor choices under changing environments, consumption-leisure choice

- trade offs, opportunity cost

11.2 Preview to absolute/comparative advantages:

Opportunity cost or economic opportunity loss is the value of the next best alternative foregone as the result of making a decision. Opportunity costs are not restricted to monetary or financial costs: the real cost of output forgone, lost time, pleasure or any other benefit that provides utility should also be considered. There is always an opportunity cost in a decision that is made either in economics or everyday life.

Example: You won a free ticket to see an Eric Clapton concert (which has no resale value). Bob Dylan is performing on the same night and is your next-best alternative activity. Tickets to see Dylan cost $40. On any given day, you would be willing to pay up to $50 to see Dylan. Assume there are no other costs of seeing either performer. Based on this information, what is the opportunity cost of seeing Eric Clapton? (a) $0, (b) $10, (c) $40, or (d) $50.

In other words - what is the minimum amount (in dollars) you would have to value seeing Eric Clapton for you to choose his concert? The correct answer is $10.

11.3 Absolute and comparative advantages

Absolute advantage refers to the ability of a particular person or a country to produce a particular good with less resources than another person or country. It can be contrasted with the concept of **comparative advantage** which refers to the ability to produce a particular good at a lower opportunity cost. It is not necessary to have an absolute advantage to gain from trade, only a comparative advantage.

Example: Imagine that Robinson can produce 10 pounds of fish per hour or 20 coconuts per hour of work. Friday can produce 20 pounds of fish per hour or 10 coconuts per hour. In this example Robinson has absolute advantage in producing coconuts and Friday has absolute advantage in producing fish.

Opportunity cost: Robinson's opportunity cost of producing 1 fish is 2 coconuts, Friday's opportunity cost of producing 1 fish is 0.5 coconut. In other words, for each fish produced Robinson has to give up 2 coconuts. Friday has lower opportunity cost of producing fishing. We say that he has **comparative advantage** in fishing and hence he should specialize in fishing. Similarly, Robinson has comparative advantage in coconut production. Robinson can get more fish by specializing in coconut production and trading coconuts for fish while Friday can benefit by trading fish for coconuts.

Comparative advantage explains how trade can create value for both parties even when one can produce all goods with less resources than the other. The net benefits of such an outcome are called gains from trade. Having a comparative advantage is not the same as being the best at something. In fact, someone can be completely unskilled at doing something, yet still have a comparative advantage at doing it! How can that happen?

Example: Now imagine that Robinson can produce 25 pounds of fish per hour or 25 coconuts per hour of work. Robinson only likes coconuts so he will spend all the time picking them. Friday can only produce 10 pounds of fish per hour or 20 coconuts per hour. Friday only likes fish so he will spend all the time catching fish. In this example Robinson has absolute advantage in both coconuts

and fish production. So it could seem that Robinson has no interest in trade with Friday. However, there is some space for trade that will be beneficial for both Robinson and Friday. Without any trade Robinson's and Friday's consumption is:

$$(F_R, C_R) = (0, 25)$$
$$(F_F, C_F) = (10, 0)$$

Robinson's opportunity cost of producing 1 pound of fish is 1 coconut (recall that opportunity cost is how many coconuts Robinson gives up by producing 1 pound of fish). Friday's opportunity cost of producing 1 pound of fish is 2 coconuts. Since Robinson's opportunity cost is lower he should specialize in fish production. Similarly, Robinson's opportunity cost of producing 1 coconut is 1 pound of fish and Friday's opportunity cost of producing 1 coconut is 0.5 pounds of fish. Friday's opportunity cost is lower and hence he should specialize in coconut production.

If Robinson and Friday agree on mutually beneficial exchange rate 1 pound of fish for 1.25 coconuts (or equivalently 1 coconut for 0.8 pound of fish) they can do the following: Friday produces 20 coconuts and exchange them for $0.8 * 20 = 16$ pounds of fish. Robinson produces 16 pounds of fish and $25 - 16 = 9$ coconuts. He exchanges 16 pounds of fish for 20 coconuts and as a result their consumption after trade is:

$$(F_R, C_R) = (0, 29)$$
$$(F_F, C_F) = (16, 0)$$

Despite the fact that Robinson has absolute advantage in production of both fish and coconuts they still can both benefit from the trade.

NOTE: To find people's comparative advantages, do not compare their absolute advantages. Compare their opportunity costs.