Alternative Microeconomics

Chapter five Criteria to Evaluate Alternatives

I CRITERIA FOR EVALUATION

Ends and means must be evaluated and ranked to make choices.

Individuals must make choices about their objectives (or ends) and the alternatives (means) they choose to achieve those objectives. To make these choices, it is necessary to value or prioritize ends and means. The process of ranking and the ultimate selection of priorities require criteria to value the alternatives.

Traditions and institutions are short cuts to making choices about alternatives

Both ends and means can be ranked on the basis of tradition. Communities often develop traditional solutions to economic problems. In some societies, the solution to the problem of food acquisition may be hunting. Hunting a given specie or species of animals provides a workable solution given technology, natural and built environments. Religion and other social institutions may develop to support these solutions. Use of tradition and institutions (and rules of thumb) to choose ends and means is a way of minimizing the use of analysis and reasoning to make choices; there are a set of ready-made choices. These traditional ends and means are created and evolve as workable solutions to problems. In many cases, traditional solutions may be very effective. However, traditions by their nature persist over time (tend to maintain the status quo) and may become less effective as circumstances change. When natural or built environments change society may still cling to the traditional solutions in the face of declining success. Religion, the vested interests, desire for the old ways and human resistance to change are examples of forces that inhibit the search for new solutions. The ranking of ends and means by tradition may lag behind the changes in knowledge, technology and environmental circumstance. If traditions and existing institutions result in increasingly less successful results, new solutions that are more consistent with individual values and expectations may emerge.

Institutions and traditions may lag behind changes in technology and the environment.

CRITERIA TO EVALUATE ENDS AND MEANS

An evaluation of right and wrong requires and ethical standard.

The evaluation and ranking of both ends and means requires the application of ethical principles. At another level, the choices of means to achieve a given end may appear to be based on efficiency.

Efficiency is a measure of the extent to which and objective is achieved.

Ethics is the study of the process by which an objective (and/or the means used) is judged "right or wrong." Efficiency is a measure of the extent to which an objective is achieved. Efficiency can only be used to evaluate the means used to achieve a goal or end. Ultimately, efficiency rests on a foundation of ethics. An immoral objective can be achieved "efficiently." Nazi Germany sought "efficient" means to achieve the annihilation of an ethnic group.

Efficiency is based on ethics.

Modern, neoclassical economics is often perceived as a study of efficiency with in the context of a very specific ethical system: "utilitarianism."

ETHICS

Ethics is the branch of philosophy that studies the nature of "right and wrong" and the criteria used to evaluate the moral questions about ends, choices, means and behavior. Albert Schweitzer is quoted,

Ethics is the study of what is right and what is wrong.

> *"In a general sense, ethics is the name we give to our concern for good behavior. We feel an obligation to consider not only our own personal well-being, but also that of others and of human society as a whole."* (quoted in Hill, p 4)

Deontological ethics is based on duty.

Axiological ethics is based on the value of outcomes.

Humans tend to rationalize and justify their values, beliefs and behavior; they like to think that what they believe and do is "the right thing to do." For our purposes, there are two broad approaches to judging right and wrong. One approach is to judge the moral quality of an end or action based on duty. This is called deontological ethics. The second approach is to judge the rightness or wrongness with regard to the consequences or outcomes of actions. This approach is referred to as axiological ethics. A third approach is teleological ethics that presumes that each person or community has some unique purpose and that the moral objective should be the attainment of that purpose.

DEONTOLOGICAL ETHICS

***Deontological ethics** is based on "duty" not consequences*

In deontological ethics, right and wrong are judged on "duty." Individuals often engage in activities and make choices that are based on a sense of duty. These duties may be based on tradition, expectations or more formal rules. The rightness of behavior is can be seen as compliance with these rules. It should be noted that these rules may be implicit or explicit. The belief that individuals have an obligation to tell the truth, not to kill, to vote or to serve their country are examples of rules that specify duties. In an exchange relationship the seller (or buyer) may have a duty to provide information to the buyer (or seller).

AXIOLOGICAL OR CONSEQUENTIALIST ETHICS

*A **consequentialist ethic** is based on the outcomes or consequences of a choice or action*

Right and wrong (or goodness and badness) of an act (or choice) is based on the value of the outcome of that act (or choice) in axiological ethics. One subset of axiological ethics is consequentialist ethics. In consequentialist ethics, the consequences of actions determines what an individual ought to do and will do. Utilitarianism is a consequentialist ethic that provides the ethical foundation of orthodox microeconomics.

Utilitarianism is an ethical system that judges right and wrong [or good and bad] by the consequences of a choice

Neoclassical economics is based on Utilitarianism, a system of ethics that was formalized by Jeremy Bentham [1748-1832]. Bentham believed that seeking pleasure (happiness, satisfaction, welfare or utility) and avoiding pain determined what individuals do and should do. It is based on the goal of maximizing the welfare or utility of the people "whose interests are of concern." The rightness or wrongness of a choice is based on the outcome or the utility that results from that choice. If the total utility of the group is increased, the choice was "right." If utility is decreased, the choice was unjustified by this ethical standard. In the *Introduction to the*

Principles of Morals and Legislation (1789), Bentham makes the following observations.

Utility determines what we "ought" to do as well as what we do. It is an ethical as well as an operational principle.

- "*Nature has placed mankind under the governance of two sovereign masters, pain and pleasure. It is for them alone to point out what we ought to do, as well as what we shall do.*" (Bentham, Principles, Chapter I)
- "*By utility is meant that property in any object, whereby it tends to produce benefit, advantage, pleasure, good, or happiness or to prevent the happening of mischief, pain, evil, or unhappiness to the party whose interest is considered; if that party be the community in general, then the happiness of the community; if a particular individual, then the happiness of that individual.*" (Ibid.)
- "*The interests of the community then is, what? --the sum of the interests of the several members who compose it.*" (Ibid.)

The welfare or utility is the sum of individuals' utility. This requires that property rights are exclusive and individuals have independent utility functions

***Utilitarianism** is a **consequentialist ethic** is based on the outcomes or consequences of a choice or action*

The consequentialist ethic of Utilitarianism and neoclassical economics is based on the maximization of each individual's utility. It provides the criteria that are used to judge what we should do and it is the stimulus that directs what we do. The interest or welfare of the community is the sum of the interests of individuals therefore the sum of individuals' utilities is the community or social welfare. Anything that increases the utility or welfare of an individual or society is perceived as ethically correct.

Bentham tried to create a method to calculate the utility or welfare of a community: a "felicific calculus." His approach required that each individual's utilities be independent other individuals utility functions so that they could be added. This process is a form of "reductionism," the overall system is simply the sum of its parts. Bentham considered seven characteristics of each act to calculate the consequences. These included: intensity (of pleasure or pain), the duration, the certainty, propinquity (nearness in place or time), fecundity (capacity to produce similar results), purity and the extent or number of persons affected. Bentham argues the process is to

***Utilitarianism** is a reductionist approach to ethics.*

"Sum up all the values of all the pleasures on the one side, and those of all the pains on the other. The balance if it be on the side of pleasure, will give the good tendency of the act upon the whole, with respect to the interests of that individual person; if on the side of pain, the bad tendency of it upon the whole." (Bentham, p 39)

Bentham's utilitarianism is a benefit-cost analysis of pleasure and pain. If the pleasure associated with an act exceeds the pains associated with that act, the act is justified by consequentialist ethics. In economics, finance, accounting and policy analysis, benefit/cost analysis is often used in decision making; if the benefit/cost ratio exceeds one, the project is justified. The difference between Bentham and modern benefit/cost analysis is that Bentham's approach is much broader. In modern benefit/cost analysis, prices of goods are substituted for pleasure and pain. Only market pleasures (utiltity) and pain (cost) are used in the analysis. Pleasure and pain encompass emotional and non-market values held by individuals.

Benefit/cost analysis is based on a Utilitarian ethic.

EFFICIENCY

Efficiency is a measure of the extent to which and objective is achieved.

Efficiency is a measure of the extent to which an objective has been achieved. If an objective is immoral or unethical, efficiency can still be used to evaluate the extent to which the objective is met. Consider the construction of ovens. If an oven is "too small", there is inefficiency in the loss of energy because the door is opened and closed more frequently. If an oven is "too large" it is inefficient in heating too much space. The choice of using a toaster oven or a full size oven is a judgment about their efficiency at different tasks. If the task were to dispose of human bodies during genocide, efficiency would be important in determining the size of the ovens even though the objective is clearly immoral.

Bad or immoral objectives can be achieved efficiently.

It is possible to have objectives that are unethical or wrong and still achieve those objectives with different degrees of efficiency. If an objective were good, moral or ethically correct, then greater efficiency would be desirable. If the objective is immoral or bad, then greater efficiency is not necessarily desirable.

Means as well as objectives or ends can be evaluated by ethical standards

If there are alternative means to achieve an ethical objective, the means may have different levels of efficiency. It is also possible that the different means will be more or less ethical than others. In this case, it may be necessary to judge between an efficient less ethical means and a less efficient more ethical one.

The idea of efficiency was borrowed from physics.

Energy efficiency is often measured as:

$$\% \text{ efficiency} = \frac{\text{useful energy produced}}{\text{total energy used}} \times 100 \ .$$

Mechanical efficiency is defined as:

$$\% \text{ efficiency} = \frac{\text{output power}}{\text{input power}} X\ 100$$

In economics, efficiency can be thought of as a ratio of outputs to inputs. The resources used in production are the inputs and the goods (and services) that are produced are the output. Efficiency is not in and of itself an objective. It is possible to efficiently pursue immoral objectives. It is also possible to pursue ethical ends with unethical means.

Several variations of efficiency are relevant in economics; technical efficiency, allocative or economic efficiency and Pareto efficiency. These concepts of efficiency are straightforward; the difficulty lies in measurement of output, value of outputs, inputs and the value of inputs. In neoclassical microeconomics, utilitarian ethics is the foundation of the concepts of efficiency. Relative prices of inputs and outputs are used as proxies or surrogates for relative values. Again, remember the warning of Oscar Wilde: "A cynic is someone who knows the price of everything and the value of nothing." Price and value are not the same thing, but prices may be used as an approximation of value. Prices may not reflect all the benefits or

costs associated with a choice. They may be distorted in a variety of ways: exchange may not be voluntary; agents may engage in deception, institutions may be inconsistent with technical and environmental circumstances, regulations and other problems.

TECHNICAL EFFICIENCY

***Technical efficiency is** a ratio of outputs to inputs.*

One of the functions of an economic system is to coordinate the production of goods (and services). The technical efficiency of a productive process is the ratio of the outputs (or resources used) to the input (of goods and services). If an economic system produced two goods; Xebecs (Q_X) and Yawls (Q_Y), the output could be measured as $Q_X + Q_Y$. The inputs would be the sum of the resources used (Land (R), labour (L) and capital (K)). Efficiency can be expressed as:

$$\text{Technical efficiency} = \frac{Q_X + Q_Y}{R + L + K} = \frac{\text{output}}{\text{input}}. \qquad \textit{Equation 5.1}$$

Production Possibilities Function

The production possibilities model is a way to show all production alternatives given inputs and technology.

Efficiency as a market phenomenon can be illustrated using a production possibilities model. (Sometimes called a Production possibilities function, production possibilities curve, production possibility frontier, PPF or transformation function). The PPF is a model that identifies all the production alternatives that are possible for two goods given a set of inputs and a state of technical knowledge. Using the equation from above;

- Output is $Q_X + Q_Y$ or the quantity of good X (xebecs) plus the quantity of good Y (Yawls), there are alternative quantities of Q_X and Q_Y that can be produced. By limiting the outputs to two goods, the model can be constructed in two-dimensional space (on a graph). If three goods are considered, the model requires a thee-dimensional space.
- Inputs are: R (natural resources) + L (labour) + K (capital), these resources are finite and given at any point in time.
- The state of technology is the information the agents have about the various ways of producing different quantities of goods X (xebecs, or Q_X) and Y (yawls, or Q_Y).

If all inputs and the best technology available were allocated to the production of xebecs (Q_X), a finite quantity could be produced. In Figure 5.1 this is shown at point G on the X axis when 32 units are produced. Since no inputs are allocated to the production of yawls (Q_Y), none are produced. If the agents decided that some yawls were desired, they would have to take some of the inputs from the production of xebecs to use in the production of yawls. Since all the inputs (and best technology) were used to produce 32 xebecs in our example, any reallocation of inputs from the production of xebecs to yawls would require a sacrifice, or the production and availability of fewer units of xebecs. This can be shown as a move from point G (Q_X = 32; Q_Y = 0) to point F (Q_X = 31; Q_Y = 10). The production of 10 units of yawls requires the sacrifice of 1 units of xebecs (32-31=1). The inputs that are least effective in producing xebecs would be reallocated to the production of yawls. The sacrifice of xebecs would be minimized. (You would not shift the

best resources to produce xebecs into the production of yawl; that would maximize the sacrifice.)

At point A (Q_X = 0; Q_Y = 53), all inputs are allocated to the production of yawls so no xebecs are produced. Resources can be reallocated from the production of yawls to produce xebecs; the first five units of xebecs can be produced by sacrificing the output of 3 yawls. Again, the least effective inputs in the production of yawls would be shifted to the production of xebecs. This can be shown as a movement from point A to point B. Sacrifice of one good to produce more of the other is called "opportunity cost." We can locate other output alternatives along the PPF; points A, B, C, D, E, F, G all represents alternative outputs of xebecs and yawls. Any point that lies on the PPF is an output alternative that represents a combination of Q_X and Q_Y that can be produced given inputs and technology. Any output combination inside the PPF is possible but, would not be the maximum amounts of X and Y that could be produced. Output combinations that lie outside the PPF are not attainable or feasible given the inputs and technology available.

Given inputs and a state of technology, the alternative sets of outputs are shown by the production possibilities function. If all inputs are used to produce Yawls (good Y, or Q_Y), a maximum of 53 units can be produced. If the inputs are reallocated to produce 5 Xebecs (good X, or Q_X), it will be possible to only produce 50 yawls. At the output shown by point C, 16 units of xebecs and 40 units of yawls are produced. If all inputs are used to produce Xebecs (Q_X= 32 at point G), a maximum of 32 units of X can be produced.

Given technology and inputs, all possible output combinations are shown by all points that lie along and inside the line ABCDEFG. A change in inputs or technology will shift the production possibilities frontier.

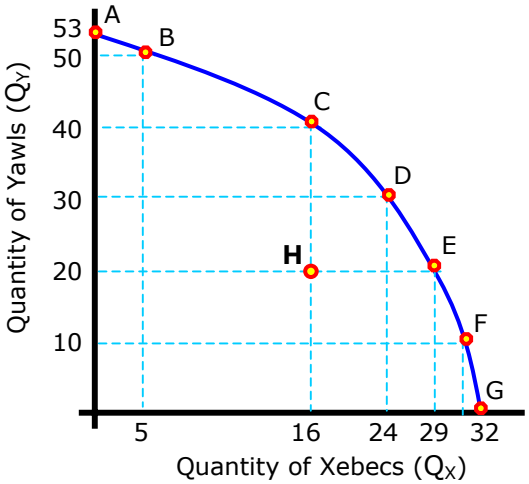


Figure 5.1

The output combination at point H (Q_X=16; Q_Y=20) is clearly not efficient; more X or Y or both can be produced given the inputs and technology. (Remember, R, L, K and technology, inputs are fixed.) Resources can be reallocated to produce more xebecs (a move to point E), to produce more yawls (point C) or more of both (any point in the triangle HEC.

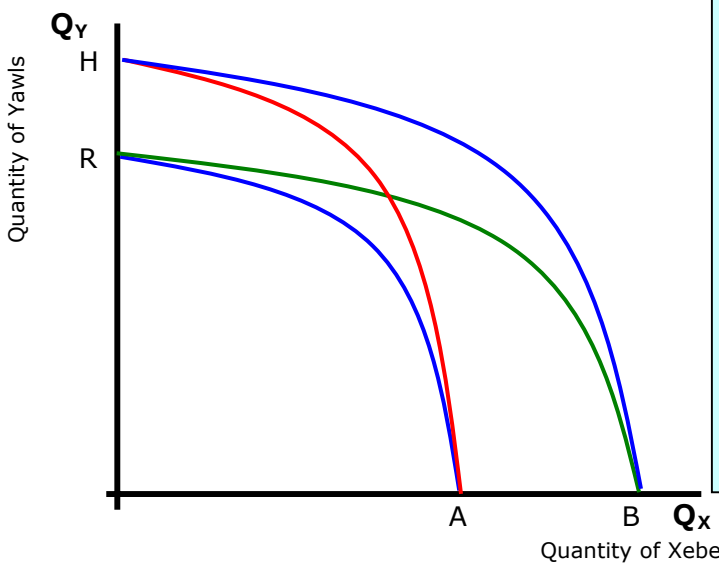
Any output combination that can be shown as a point on the PPF can be considered as "technically efficient." Any output combination that falls inside the PPF is technically inefficient; there are unused inputs or inputs are not being used for the most appropriate purpose. Clearly there is a problem; there are an infinite number of output combinations (any point on the PPF) which are technically efficient. There are also an infinite number of output combinations that lie inside the PPF that are technically inefficient.

If we expand the model to include the ratio of output to inputs, an

increase in technical efficiency could be the result of:

- an increase in the output of either good while the other good and inputs are held constant
- an increase in both goods while inputs are held constant
- a decrease in the inputs while the output is held constant
- an increase in output and a decrease in inputs.

A movement from a point inside the PPF to a point on the curve is can be regarded as an "increase in efficiency." An improvement in technical knowledge can also be regarded as an "increase in efficiency" since the same output combination could be produced with fewer inputs. The technological improvement can also be envisioned as a shift of the PPF, more output can be produced if the same quantities of inputs are used. This is shown in Figure 5.2.



Given the original PPF as line RA. An improvement in technology that impacts only the production of xebecs can be seen as a shift from RA to RB. An improvement in technology that influences only the production of Yawls would be a shift from RA to HA. Technology that impacts the production of both goods would be a shift from RA to HB. These outward shifts are sometimes called "economic growth."

A change in inputs could also be shown as shifts in the PPF, a decrease in inputs would shift the PPF inward toward the origin. An increase in inputs would shift the PPF outward.

Figure 5.2

There are an infinite number of technically efficient solutions to the allocation problem. However, there is only one allocation that achieves economic or allocative efficiency.

ALLOCATIVE OR ECONOMIC EFFICIENCY

Allocative or Economic efficiency *is measured by a ratio of the value of a choice to the costs of that choice. Prices of inputs and goods are used as estimates or proxies for their values.*

Since Xebecs (good Q_X) and Yawls (good Q_Y) are not the same things, it does not make sense to add them together (case of adding apples and oranges, $Q_X + Q_Y$). If the values of the two (or more) goods were known or there were an acceptable proxy for the value, it would be possible to add their values. Remember that one of the tasks of the economic process is to allocate resources to their highest valued use. Technical efficiency is a prerequisite for allocative efficiency.

Economic or allocative efficiency takes into account the value of both the inputs and outputs. Economic efficiency is measured by a ratio of the value of the output to the value of the inputs. Value is a

complex notion and market prices are often used as an indicator of exchange value. (Remember the warning of Oscar Wilde; "*A cynic is some one who knows the price of everything and the value of nothing*.") Lacking a better proxy for value, price is often used. If the price of good X (P_X) and good Y (P_Y) are proxies for their value and the wage or price of labour (W_L or P_L) and capital (P_K or %) were proxies for their values then allocative or economic efficiency might be represented as;

$$\text{Allocative efficiency} = \frac{\text{value of output}}{\text{value of input}} = \frac{P_X Q_X + P_Y Q_Y}{P_L L + P_K K} \qquad \textit{Equation 5.2}$$

Allocative or Economic efficiency *requires that technical efficiency be achieved but a technically efficient solution is not necessarily allocative efficiency.*

Allocative efficiency is not only influenced by the quantities of the goods produced and quantities of the inputs used, but the relative values of the inputs and outputs are also important. The benefits or value of an alternative can be expressed as $P_X Q_X + P_Y Q_Y$. The costs of the alternative could be expresses as $P_L L + PK_K$. Given a set of inputs and technology the solution that achieves allocative efficiency is the highest valued output possible given the inputs and prices.

Using the same production possibilities function as in Figure 5.1, allocative efficiency can be described in Figure 5.3. In this example, the optimal output alternative is that with the highest value. Since value cannot be measured directly, neoclassical economists use market price as an approximation of value. In order for market price to be a reasonable approximation, exchanges must be voluntary exchanges of goods with exclusive property rights. If the price of xebecs were \$4 and the price of yawls were \$2 the "value" of each alternative identified in Figure 5.2 can be calculated. Alternative A is worth \$106, alternative B is worth \$120, C is worth \$144, D is worth \$156, E is also "valued" at \$156. The output at alternative F is worth \$144 and at G is worth \$128. These calculations can be seen in Table 5.3. The highest valued output, based on market prices will lie on the PPF between alternatives C (valued at \$156) and D (also \$156).

The PPF is determined by the finite quantity of inputs and technology. If the price of xebecs is \$4 (P_X=\$4) and the price of yawls is \$2 (P_Y=\$2), at point A the "value" of good X is 0 and the "value" of good Y is \$106, the "value" of the output (given prices) is \$106.

At point B the value of the output of good X is \$20 (\$4x5 units X), the value of good Y is \$100 (\$2x50 units Y). The value of output of good X and Y is \$120.

At D and E the value of the output is \$156. Some where between alternatives D and E on the PPF the value of the output will reach a maximum. It is where the slope of the PPF is equal to P_X / P_Y.

Any alternative inside the PPF will be valued at less than the maximum value.

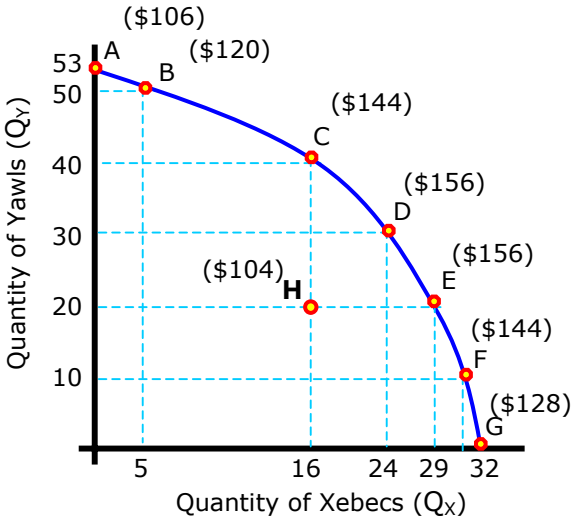


Figure 5.3

If the prices of the goods are accepted as the value of the goods, the calculation of each alternative are shown in Table 5.1

Table 5.1
Allocative Efficiency and Value of Output

Alternative	Q_X	P_X	Value of output of X (P_X Q_X)	Q_Y	P_Y	Value of output of Y (P_Y Q_Y)	Value of output (P_XQ_X + P_YQ_Y)
A	0	$4.00	$0.00	53	$2.00	$106.00	$106.00
B	5	$4.00	$20.00	50	$2.00	$100.00	$120.00
C	16	$4.00	$64.00	40	$2.00	$80.00	$144.00
D	24	$4.00	$96.00	30	$2.00	$60.00	$156.00
E	29	$4.00	$116.00	20	$2.00	$40.00	$156.00
F	31	$4.00	$124.00	10	$2.00	$20.00	$144.00
G	32	$4.00	$128.00	0	$2.00	$0.00	$128.00
H	16	$4.00	$64.00	20	$2.00	$40.00	$104.00

Max value

If the price of good Y should rise to $3.50 (and the price of X stay at $4) the alternative with the "highest value" is at point C as shown in Table 5.2.

Table 5.2
Allocative Efficiency and Value of Output

Alternative	Q_X	P_X	Value of output of X (P_XQ_X)	Q_Y	P_Y	Value of output of Y (P_YQ_Y)	Value of output (P_XQ_X + P_YQ_Y)
A	0	$4.00	$0.00	53	$3.50	$185.50	$185.50
B	5	$4.00	$20.00	50	$3.50	$175.00	$195.00
C	16	$4.00	$64.00	40	$3.50	$140.00	$204.00
D	24	$4.00	$96.00	30	$3.50	$105.00	$201.00
E	29	$4.00	$116.00	20	$3.50	$70.00	$186.00
F	31	$4.00	$124.00	10	$3.50	$35.00	$159.00
G	32	$4.00	$128.00	0	$3.50	$0.00	$128.00
H	16	$4.00	$64.00	20	$3.50	$70.00	$134.00

Max value

The alternative that is allocatively or economically efficient is dependent on a set of prices that measures value. We will explore the ability of the market to accurately reflect values of outputs. It is also important to note that there are many things that humans value that cannot be expressed as a market price.

PARETO EFFICIENCY

Pareto Efficiency *is a condition where there are no other alternatives that would improve the welfare or utility of at least one other person without making someone else (or others)"worse off"*

At a technical level, economics provides a set of tools to aid in choosing among competing alternatives. In 1906 an Italian, French, Swiss, engineer, sociologist, economist Vilfredo Pareto (1848-1923) introduced the concept of Pareto optimality as a means to undermine the role of utilitarianism in economics. Instead, it became the foundation for what is now called benefit cost analysis and its derivative measures of allocative performance such as rate of return on investment and cost effectiveness.

Consider a community of individuals. Your task is to choose an alternative to maximize the welfare or utility of the group. If there were an alternative that would improve the welfare (or increase the utility) of at least one person in the group without making any one worse off (decrease their welfare or utility), you should choose to that alternative. However, if all the alternatives that would make at least one person better off would also make at least one other person worse off, you cannot know if that alternative would improve the wellbeing (utility) of the group.

Pareto efficiency is the condition where all alternatives that would increase the welfare of at least one person without decreasing the welfare of others have been exhausted. There is nothing that can be done to improve the welfare of anyone without making someone else worse off. In the PPF model (Figure 5.4), Pareto efficiency exists at any point on the PPF once you have attained that point.

Given the PPF, point H is not Pareto efficient: more X (Y) can be produced with no sacrifice of good Y (X). A move to any output combination identified in the triangle HEC is a Pareto improvement; some one (or everyone) is better off and no one is any worse off; this area is Pareto Safe. A move to any point in the Pareto Safe area is a Pareto improvement or is Pareto superior.

Once on the PPF (point D for example) any change to improve the welfare of an individual (or group) who prefers good Y, would make those who prefer good X "worse off." To increase the quantity of Y, from point D to point C, would require that less X would be produced.

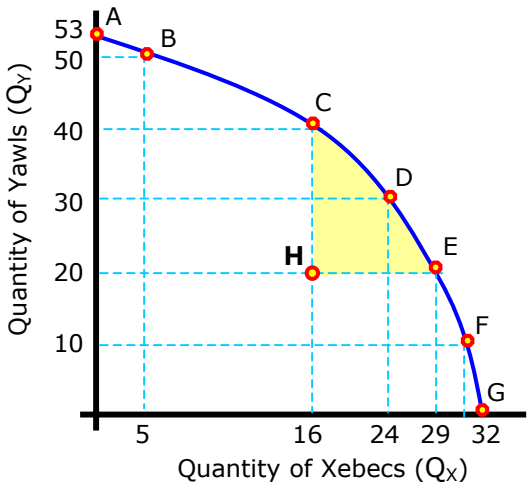


Figure 5.4

Pareto efficiency can be used as a criterion to decide whether to chose an alternative. If a choice makes some one better off and no one any worse off, it is a choice that will increase the achievement of the goal or end of maximizing the utility or welfare of the group. This can be

Pareto Safe *is the set of alternatives where someone benefits and no one is any worse off.*

"**Pareto Safe**," i.e. the output can be altered so someone is "better off" and no one is worse off. Any change that increases the welfare of one person or persons that does not reduce the welfare of

Pareto improvement *is an act that increases the welfare of at least one person and no one is any worse off*

another is a "**Pareto improvement**" or Pareto Safe and will clearly increase the welfare or utility of the community. Any alternative that results in a greater utility of at least one person and no decrease in the utility of anyone can be referred to as "**Pareto superior**."

Pareto potential *is an act that increases the welfare of at least one person and no one is any worse off*

This is the foundation of benefit/cost analysis. Rate of return on investment (ROI is a ratio of the return [benefit] to investment [cost]) is another variation of this idea.

The problem is that this criterion tends to support the status quo. Almost all choices that increase the utility of an individual or group will make others worse off. Since a Pareto efficiency criterion is very restrictive, **Pareto Potential** is may be used. This is the same as the benefit/cost criterion. Pareto potential holds that if a choice or alternative makes one person or group better off but others are worse off, if the "winners" or those who gain can hypothetically reimburse those who are "losers" (or are worse off) and still be better off, the alternative will increase the utility of the group. In a more simplistic way, the benefits associated with the choice exceed the costs.

PARETO POTENTIAL, BENEFIT/COST AND MARGINAL ANALYSIS

The Pareto potential criterion for decision making is the foundation of analysis that use benefit/cost, cost effectiveness and rate of return for decision making.

Marginal Analysis

The process of making decisions is like the proverb "The longest journey begins with the first step." Or like the question posed by Albert Camus (1913-1960) about the individual deciding each day about suicide or continuing life. The individual taking a journey must make the decision about taking the first step before they decide on the second. In Camus' case, one must decide not to committee suicide before you tackle the rest of the day.

Marginal analysis and the rate of change in a dependent variable caused by a change in an independent variable

Decisions in economics are always made at the "margin." A decision to change one variable will cause a change in some other related variable. An act or choice will have benefits and costs associated with that act. An increase in the production of xebecs may require a reduction in the production of Yawls; the benefit is more xebecs, the cost is fewer yawls.

A change in the price of a good will change the quantity sold, a change in the quantity sold will change the total revenue collected. The change in total revenue caused by a change in units sold is called marginal revenue. The marginal concept is applied to a wide variety of relationships. In principles of economics, these are usually described as a "one unit" change in the variables. The Greek letter delta, Δ is used to identify a change calculated by subtraction. In other cases, a derivative (d) or partial derivative (∂) will be used to denote a change that approaches 0.

The use of marginal is applied to many economic relationships. In fact, the early period of the development of microeconomics (mid to late 19th century) was called the "*marginalist revolution*." Below are some definitions of several useful marginal relationships.

Marginal Cost (MC)

Marginal cost as the change in cost attributed to a change in output

MC is defined as the change in Total Cost (TC) or variable cost (VC) caused by a one unit change in the quantity produced, output (Q). MC represents opportunity cost.

$$MC = \frac{\Delta TC}{\Delta Q} = \frac{\Delta VC}{\Delta Q}$$ **Equation 5.3**

Marginal Benefit (MB)

Marginal benefit as the change in total benefits attributed to a change in quantity

MB is defined as the change in total benefit (TB) caused by a one unit change in quantity consumed (Q).

$$MB = \frac{\Delta TB}{\Delta Q}$$ **Equation 5.4**

Marginal Utility (MU)

Marginal Utility is the change in total utility caused by a change in consumption

MU is the change in utility caused by a change in quantity consumed (Q)

$$MU = \frac{\Delta TU}{\Delta Q}$$ **Equation 5.5**

Choice and Marginal Analysis

If Pareto Potential or the Benefit/Cost criteria are to be used for decision-making, the rule is quite simple; if the benefits associated with a choice (or alternative) exceed the costs associated with that choice, then the choice will increase net benefits. If the costs of an alternative exceed the benefits of that alternative, then that alternative is not a good choice.

EXAMPLE BENEFIT/COST USING MARGINAL ANALYSIS

Using the example PPF presented in Figure 5.5 (Same PPF as in 5.1, 5.3, 5.4)

Original allocation is at H (Q_X=16, Q_Y=20);
P_X = \$4 and P_Y = \$3.50

Alternative E (C, D or any choice in triangle HEC) has no MC, the output of X or Y or both X and Y increases so the MB is positive. The B/C ratio of any alternative is grater than one, the MB>MC.

If production were at point D (Q_X=24, Q_Y=30), a choice of alternative C would result in Q_X=16, Q_Y=40, 8 units of X are traded for 10 units of Y. Six fewer units of X at \$4 each is a MC of \$24. The MB is 10 additional units of Y at \$3.50 each or \$\$35. The MB>MC, The B/C ratio >1, the net benefits will increase by \$11 by selecting alternative C over D. Alternative C is worth

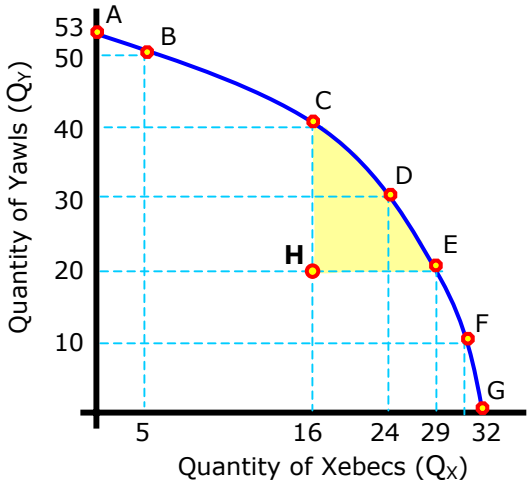


Figure 5.5

Consider the PPF in Figure 5.5; Xebecs are priced at \$4 (P_X= \$4) and yawls are \$3.50 (P_Y = \$3.50). If the initial output were where

Q_X= 16 and Q_Y = 20, which is represented at point H. At these prices, the output of xebecs is "worth" $64 and yawls are worth $70. The "value" of the output alternative identified at point H is $134.

Ranking of Alternative H with Alternative E

If alternative E were chosen over alternative H, 13 additional units of xebecs would be produced (29-16=13). This is the marginal benefit (MB) of the choice of reallocating resources from alternative H to E. If xebecs were valued at $4 each, that would be a MB of $52 in monetary terms. This can be viewed as a move from row H to row E in Table 5.3

This reallocation of resources would not reduce the output of yawls, so the marginal cost of the reallocation is 0. Since the MB > MC, the reallocation or inputs to move the output alternative from H to E would be an improvement in the achievement of the objective (producing the highest valued output). The output of xebecs and yawls at point E is $186 (134 + 52; the value of the output at H added to the MB of reallocation of inputs)

The relative prices of xebecs and yawls are irrelevant since the marginal cost (MC) is zero. Any increased production of xebecs at any positive price would be a Pareto improvement. A reallocation to point D, C or any output combination that lies in the triangle HEC would be a Pareto improvement (or Pareto superior to the allocation at point H).

Table 5.3
Allocative Efficiency and Value of Output

Alternative	Q_X	P_X	Value of output of X (P_XQ_X)	Q_Y	P_Y	Value of output of Y (P_YQ_Y)	Value of output ($P_XQ_X + P_YQ_Y$)
A	0	$4.00	$0.00	53	$3.50	$185.50	$185.50
B	5	$4.00	$20.00	50	$3.50	$175.00	$195.00
C	16	$4.00	$64.00	40	$3.50	$140.00	$204.00
D	24	$4.00	$96.00	30	$3.50	$105.00	$201.00
E	29	$4.00	$116.00	20	$3.50	$70.00	$186.00
F	31	$4.00	$124.00	10	$3.50	$35.00	$159.00
G	32	$4.00	$128.00	0	$3.50	$0.00	$128.00
H	16	$4.00	$64.00	10	$3.50	$70.00	$134.00

Ranking of Alternative E with Alternative F

If the current output were at point E (Q_X= 29 and Q_Y = 20), and alternative F (Q_X= 31 and Q_Y = 10) is considered. The marginal benefit (the benefit associated with reallocating resources to point F) would be an additional 3 units of xebecs (31-29=3). At $4 each

this is a MB of $12 in monetary terms. However, the reallocation of resources from H to F requires a sacrifice or MC of 10 units of yawls (20-10=10). At a price of $3.50 the MC is $35 in monetary value. The MC = 35; MB = 12. A reallocation of inputs to move from point E to point F would be trading $12 for $35; not a good idea.

Ranking of Alternative E and Alternative D

A reallocation of resources from alternative E to alternative D would result in an increased output of 10 yawls. At a price of $3.50, the MB is $35. This reallocation reduces the output of xebecs from 29 to 24, a marginal cost of 5 units of xebecs. At $4 each this is a MC of $20. Since the MB > MC (35 > 20), the reallocation of inputs from the production of the output at point E to point B is justified by our benefit/cost criterion. Notice that the net gain to society is $15, so point D is "worth" $15 more than the output at point E. D is "valued" at $201 and E is "valued" at $186 (186 +15 = 201).

Can a reallocation of inputs from the production of the output at point D to point C be justified using the Pareto potential criterion?

Complications

This analysis is simplified. There are a number of questions.

When the "winners" gain more than the losers, the reallocation is justified. The winners can hypothetically reimburse the losers but the reimbursement may never occur. The alternative at point C is preferable to that at point D. The net marginal benefit of a reallocation form D to C is $3. The individuals who have a preference for xebecs are "worse off" (losers) Those who prefer yawls are "better off" (winners).

Can the redistribution of benefits from one group to another be justified on ethical grounds? Consider a reallocation of water from storage behind a dam to a free flowing river. Irrigators and power users may incur significant costs while the fishermen and white water rafters gain. A tax cut clearly benefits some individuals but may impose costs on others. There may be no mechanism by which the losers can be compensated by the winners.

Another issue is that if the move from D to C involves fewer xebecs and more yawls. The increase in yawls might cause the price for yawls to fall while the decrease in xebecs could feasibly result in a price increase for xebecs.

If the winners of an action can hypothetically compensate the losers and still be better off, the benefits exceed the cost of the action. The benefit/cost ratio is greater than one and is justified by the Pareto Potential criterion. There are still ethical questions involved.

SOME PRACTICAL ETHICS

The ideas of justice and ethics are often considered a matters of individual preference and therefore impossible to evaluate. What I consider just, someone else may perceive as unjust. It has been a perplexing problem that has been addressed by philosophers over the ages. Plato and Aristotle both were concerned with justice. Adam Smith saw justice as a necessary

requirement for a civil society. Ethics is important. One of the approaches that is applicable in economics is the "veil of ignorance" as described by John Rawls.

> *"It is assumed, then, that the parties do not know certain kinds of particular facts. First of all, no one knows his place in society, his class position or social status; nor does he know his fortune in the distribution of natural assets and abilities, his intelligence and strength, and the like. Nor, again, does anyone know his conception of the good, the particulars of his rational plan o life, or even the special features of his psychology such as his aversion to risk or liability to optimism or pessimism. More than this, I assume that the parties do not know the particular circumstances of their own society. That is, the do not know its economic or political situation, or the level of civilization and culture it has been able to achieve, the persons in the original position have no information as to which generation they belong. These broader restrictions on knowledge are appropriate in part because questions o social justice arise between generations as well as within them, for example, the question of the appropriate rate of capital saving and of the conservation of natural resources and the environment of nature. There is also, theoretically anyway, the question of a reasonable genetic policy, In these cases too, in order to carry through the idea of the original position, the parties must not know the contingencies that set them in opposition, They must choose principles the consequences of which they are prepared to live with whatever generation they turn out to belong to."* (Rawls, P 137)

Rawls' veil of ignorance holds that whatever your circumstances you perceive it as "fair.".

Individuals must be prepared to be placed in a society and no matter the circumstances, say "That's fair."

EFFICIENCY AND ETHICS (AGAIN!)

There are ethical implications associated with decisions made with efficiency criteria.

If the objective is to maximize the welfare or utility of a group, an alternative with a benefit/cost ratio that exceeds 1 will increase the utility of that group. The winners can hypothetically reimburse the losers and still be better off. If the hypothetical reimbursement is not actually made, the distribution of wealth, income and the level of goods that each person can potentially consume will be altered. Some people are better off and other people are worse off. This change in relative welfare of individuals is an ethical question, not one of efficiency, although it often masquerades as a question of efficiency.

Consider a case of a society. Under the present conditions, there is a distribution of income and wealth that results in different individuals consuming differed quantities of goods. These individuals probably have different preferences and derive different levels of utilities from the given good. A tax cut will make some people better off; they pay fewer taxes. Since the government has less revenue, they must cut some programs; grants for low income students to attend college, road construction, etc. Students, employees at universities, movie theaters near the university, trucking companies, and consumers who must pay higher prices because it costs more to transport goods may be worse off. Taxpayers with lower taxes, firms where these taxpayers spend their increased incomes and workers who are hired by the firms are better off than before. If the benefits exceed the costs, the winners could hypothetically reimburse the

losers. If the reimbursement is not actually made (which it probably will not), there is an ethical question about taking from one group to benefit another.