Chapter 1
Introductory Concepts

1.1. Efficiency Concepts

The predominant efficiency concept in economics is *Pareto optimality* (or Pareto efficiency). This concept is based on two definitions. First, we say that an allocation A is *Pareto superior* to another allocation B if everyone is at least as well off under A as under B, and one or more are strictly better off under A. In other words, no one would oppose a switch from B to A. Second, we say that an allocation A is *Pareto optimal* (or Pareto efficient) if there does not exist any other allocation that is Pareto superior to it.

To illustrate this concept more formally, consider a two-person economy consisting of individuals whose utility functions over wealth are given by $U_1(w_1(x))$ and $U_2(w_2(x))$. Here x is a legal rule that affects the allocation of resources (e.g., the rule for assigning liability in accident cases). The Pareto optimal outcome is found by choosing x to maximize U_A subject to the constraint that $U_2 \geq U_2^0$ for some arbitrarily chosen U_2^0. The solution to this problem for different values of U_2^0 traces out the *utility possibility frontier* (UPF) as shown below (Figure 1.1). All Pareto optimal allocations must be on this frontier; otherwise, one individual's utility can be raised without lowering the other's.

An important shortcoming with the Pareto criterion is that points on the frontier are non-comparable—that is, there is no way to rank them using the Pareto criterion. One way to resolve this non-comparability problem is to define a *social welfare function*, $W(U_1, U_2)$, whose arguments are the utility levels of all individuals in the economy. The social problem is then to choose x to maximize $W(U_1, U_2)$ subject to the UPF. The result is shown in Figure 1.1 by the tangency of an iso-welfare line with the UPF.

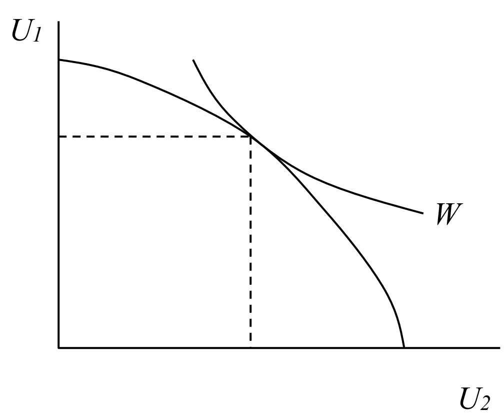

Figure 1.1. Utility possibility frontier.

This solution does not really resolve the problem, however, because it begs the question of where the weights attached to the individual utilities in W come from.

Another approach for overcoming the non-comparability problem is to ask whether the gainers from a reallocation (a change in x) would be able to fully compensate the losers and remain at least as well off. Such a reallocation is said to be efficient in a *Kaldor-Hicks* sense if the answer is yes, *even though compensation is not actually paid.* (If it were paid, the change would be an actual Pareto improvement.)

Kaldor-Hicks efficiency is equivalent to *wealth maximization*. (And for discrete changes, it amounts to cost-benefit analysis). To see the equivalence, let T be a transfer payment from person 1 to person 2 (if $T<0$, it is a payment from 2 to 1), and write the social problem as

$$\text{Max } U_1(w_1(x)-T) \text{ subject to } U_2(w_2(x)+T) \geq U_2^0$$

The first-order conditions for x and T are

$$U_1'(\partial w_1/\partial x) + \lambda U_2'(\partial w_2/\partial x) = 0 \qquad (1.1)$$

$$-U_1' + \lambda U_2' = 0 \qquad (1.2)$$

where λ is the Lagrange multiplier. Substituting (1.2) into (1.1) yields

$$\partial w_1/\partial x + \partial w_2/\partial x = 0 \qquad (1.3)$$

which is the condition for choosing x to maximize w_1+w_2.

1.2. The Coase Theorem

A fundamental concept in law and economics is the Coase Theorem, which was first demonstrated in the seminal paper by Coase (1960). We will refer to the Coase Theorem throughout the subsequent chapters, so it will be useful to review it here.

We illustrate the Theorem with a slightly more formal version of one of Coase's examples. Consider a farmer and rancher who occupy adjoining parcels of land. The rancher's profit depends on his herd size according to the function $\pi(h)$, where h_r, the profit-maximizing size, solves $\pi'=0$. We assume $\pi''<0$, implying decreasing marginal benefits (i.e., π' is downward sloping—see Figure 1.2).

Cattle from the farmer's herd sometimes stray onto the farmer's land causing crop damage, $d(h)$, which is increasing in the herd size, $d'>0$. (Assume $d''>0$, implying increasing marginal costs.) The socially optimal herd size, h^*, maximizes $\pi(h)-d(h)$. That is, h^* solves the first-order condition $\pi'(h)=d'(h)$. It follows that $h_r>h^*$, as shown in Figure 1.2.

If the rancher is taxed or faces liability for crop damage, he will internalize the rancher's loss and choose h^*. However, if he faces no liability, it is generally assumed that he will ignore the farmer's loss and choose h_r.

Coase argued, however, that if the farmer and rancher can bargain costlessly, the farmer will pay up to d', his marginal loss, for each steer that the rancher removes from his herd, and the rancher will accept any amount greater than π', his marginal benefit, to reduce his herd by one steer. A bargain is therefore feasible as long as $d' \geq \pi'$, which is exactly the range where the herd is too large. Bargaining therefore achieves the efficient herd size of h^* regardless of the initial assignment of rights overt the cattle. This is the Coase Theorem.

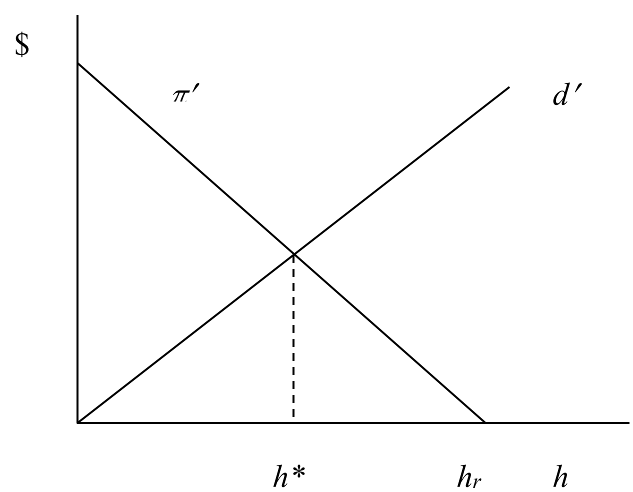

Figure 1.2. The Coase Theorem.