CHAPTER 20

General Policy Design Principles

Listening to many economists and even policy makers, one might often get the impression that the only role of government is to create conditions that allow the market to function. The argument is that not only are markets the best institution available for allocating scarce resources to attain our desired goals, but they are also the best way to determine what our goals are. After all, if the mere act of buying and selling reveals people's preferences, the job of both economist and policy maker is simply to allow the market to satisfy those preferences. But we know that this is not the case. Markets by definition can only reveal preferences for market goods, yet many of the goods and services that enhance human welfare are nonmarket goods. Thus, not only do markets fail to reveal preferences for these resources, they also fail to allocate them effectively.[1] Markets also fail to address the issues of scale and distribution. Therefore, the first point we must make in this chapter is that the market cannot tell us how much clean air, clean water, healthy wetland, or healthy forest we should have, or what level of risk is acceptable when the welfare of future generations is at stake. Nor can it tell us what is a desirable initial distribution of resource ownership.

[1]Also, it is not strictly true that markets reveal preferences even for market goods; they reveal choices, which are, to be sure, an expression of preferences, but a very conditioned expression under the constraint of existing prices and incomes.

THE SIX DESIGN PRINCIPLES

We have already seen the even more fundamental point in Chapter 3 that, at a minimum, policy requires two philosophical presuppositions: first, that there are real alternatives (nondeterminism); second, that some states of the world really are better than others (nonnihilism). We now examine six general design principles for policies, followed by a consideration of their proper sequencing and of how and where policy interventions should first impinge on the market—that is, on quantity or price—at the input or output end of the throughput? We end the chapter with further reflections on property rights. Then, in Chapters 21–23, within the guidelines of the design principles, we will offer some particular policies for promoting a steady-state economy—one that is sustainable, just, and efficient.

1. Economic policy always has more than one goal, and each independent policy goal requires an independent policy instrument.

If there is only one goal, the problem is technical, not economic. For example, building the most powerful engine possible is purely a technical problem. But building the most powerful engine that is not too heavy to power an airplane involves two objectives, power and lightness, that have to be optimized in terms of a higher goal—making an airplane fly. This is already an economic problem of optimizing the combination of conflicting goals, even though we encounter it at an engineering level.

In ecological economic policy, we have three basic goals: sustainable scale, just distribution, and efficient allocation. Nobel laureate Dutch economist Jan Tinbergen set forth the principle that *for every independent policy goal we must have an independent policy instrument*.[2] You have to be very lucky to hit two birds with one stone—it nearly always takes two stones to hit two birds flying independently. For example, should we tax energy and raise its price for the sake of inducing more efficient use, or should we subsidize energy and lower its price to help the poor? This question is endlessly and uselessly debated. One instrument (price of energy) cannot serve two independent goals (increase efficiency, reduce poverty). We need a second instrument, say an income policy. Then we can tax energy for the sake of efficiency, and distribute income (perhaps from the tax proceeds) to the poor for the sake of alleviating poverty. With two policy instruments, we can serve both efficiency and equity. With only one instrument, we are forced to choose either efficiency or equity.

Since ecological economics insists on three basic goals, it is already

[2] J. Tinbergen, *The Theory of Economic Policy*, Amsterdam: North Holland Publishing, 1952.

clear that we will need three basic policy instruments. The three goals are "independent" in the sense that attaining one will not bring about attainment of the others. Of course the goals are not "isolated" in the sense of having nothing to do with each other—they are, after all, parts of a single economic system. Now that we know how many instruments, what other principles will help answer the question: What kind of instruments? The remaining principles attempt to give guidance in this regard.

2. Policies should strive to attain the necessary degree of macro-control with the minimum sacrifice of micro-level freedom and variability.

Consider this example. If what is limited is the capacity of the atmosphere to absorb CO_2, it is important to limit the total CO_2 emissions. Average per-capita emissions times population will have to equal the limited total. But it is not necessary that each and every person emit exactly the per-capita average. There is room for micro-variation around the average in the light of particular conditions, as long as the total is fixed.

Let's take another example. Population stability requires the average of 2.1 children per couple. But it is not necessary (or even possible in this case) for each family to have the required average number of children corresponding to generational replacement. Macro-control is compatible with varying degrees of micro-variability around the average. In general we should opt for the least micro-restrictive way of attaining the macro-goal. Markets are useful in providing micro-variability, but by themselves they do not provide macro-control.

3. Policies should leave a margin of error when dealing with the biophysical environment.

Since we are dealing often with staying within biophysical limits, and since those limits are subject to much uncertainty and at times irreversibility, we should leave a considerable safety margin, or slack, between our demands on the system and our best estimate of its capacity. If we go right up to capacity, we cannot afford mistakes because they are too costly. The inability to tolerate mistakes, or sabotage, exacts a large price in reduced individual freedom and civil liberties.

Security issues surrounding the nuclear fuel cycle and the safeguarding of plutonium have already given us a foretaste of the problems involved in living too close to the edge. Our historical experience with small life-support systems operating close to capacity—namely, spaceships, or even ordinary ships or submarines—has thus far not permitted democracy. Military levels of order and discipline are required on fragile vessels operating near carrying capacity. Only our large spaceship Earth, with lots of slack, can be sufficiently forgiving of error to tolerate democracy. There are political as well as economic costs to excessive scale, a fact that has received too little attention.

4. Policies must recognize that we always start from historically given initial conditions.

Even though our goal may be far from the present state of the world, the latter remains our starting point. We never start from a blank slate. Present institutions must be reshaped and transformed, not abolished. This imposes a certain gradualism. Even though gradualism is often a euphemism for doing nothing, it is nevertheless a principle that must be respected.

What are our present institutions? Basically, the market system and private property, but also public property and government regulation. The World Bank and the IMF may be with us for a while, even though they are not nearly as basic an institution as private property or the market. We have neither the wisdom nor the time to start over again without our most fundamental institutions, even if we could imagine alternatives. The considerable stretching and bending of these institutions that we will recommend will be thought radical by some, so it is important to emphasize the conservative principle of starting from where we are, even if the basic idea is not to remain there.

5. Policies must be able to adapt to changed conditions.

Change is an ever-present reality. Human impacts on the ecosystem are enormous, and are likely to cause new problems over time. Ecosystems themselves naturally show considerable variation over time—where time can be measured in seasons, years, or eons. Human knowledge is increasing, leading to a new awareness of previously unrecognized problems, as well as new solutions to old ones. The economic system is also continually evolving, and policies that work well now may not work as the system changes.

In addition, we may find that some policies that seem ideal in theory may not be ideal when implemented, and they may even have seriously negative unforeseen side effects. As we apply policies, we will learn how they work in the real world, and thus learn how to improve them. The process of developing and implementing policy solutions must respond to this feedback, and real-life outcomes must carry far more weight than stylized theories. **Adaptive management**—changing our policies as conditions change and as we learn more—must be a guiding principle. Indeed, we believe that ecological economics itself is an example of adaptive management to the problems arising from the transition from an empty to a full planet.

6. The domain of the policy-making unit must be congruent with the domain of the causes and effects of the problem with which the policy deals.

This is often called the **principle of subsidiarity**. The idea is to deal with problems at the smallest domain in which they can be solved; problems should be addressed by institutions on the same scale as the problem. Don't seek global solutions for local problems, and don't try to solve global problems with purely local measures.

Consider the example of garbage collection. Garbage collection is largely a municipal problem. Aggregating all municipal garbage collections into a "global garbage problem" is not helpful. Deal with it at the municipal level, at least in the first instance. If local garbage has to be disposed of farther and farther away, or if it contaminates air or water and is thus transported far away, then it becomes a correspondingly larger problem—county, state, region, and so on. By contrast, global warming is fundamentally a global problem, because emissions anywhere affect the climate everywhere. Here we really do need global policy.

Which Policy Comes First?

In ecological economics we have three basic goals, so we need three basic policy instruments. The goal of efficient allocation requires the instrument of the market, at least for goods that are private (excludable and rival). For public goods the market will not work. The goal of sustainable scale requires a social or collective limit on aggregate throughput to keep it within the absorptive and regenerative capacities of the ecosystem. The goal of distributive fairness requires some socially limited range of inequality imposed on the market. As we have seen, the market cannot achieve distributive equity or sustainable scale. Furthermore, the market cannot even attain allocative efficiency unless the distribution and scale questions have already been answered. So now we know that in the sequencing of policy instruments the market comes third, after its preconditions have been established.

But what about the sequencing of scale and distribution? Here it is reasonable to put scale first, because limiting scale usually means that previously free natural resources and services have to be declared scarce economic goods.

THINK ABOUT IT!
Why is this so? Why would limiting scale make previously "free" resources scarce economic goods?

Once they are scarce, they become valuable assets, and the question of who owns them must be answered. That is an issue of distribution. The logic is that of the "cap and trade" policies. For example, the total scale of SO_2 emitted into an airshed is capped at a scale deemed sustainable. The right to emit SO_2 is no longer a free good. Who owns that right? Previous users? All citizens equally? The state collectively? Some answer to the distributive question must be given before trading in a market can solve the allocative problem. People cannot trade what is not theirs. Some goods that were outside the market can be made marketable goods (i.e., excludable). By limiting the scale of resource use and distributing the ownership of the resource, we can convert nonmarket into marketable goods. But as we saw earlier, not all goods can be converted into market goods. Many good things are inherently nonrival or nonexcludable. We will return to this issue.

The set of prices that corresponds to a Pareto optimal allocation will be different if we set the cap differently, or if we distribute ownership differently. This means that we cannot set the cap or distribution according to computations of their social costs and benefits based on existing prices. To do so would be to engage in circular reasoning because the prices depend on the scale or distribution. The ideal scale or distribution, calculated on the basis of existing prices, would, if attained, result in a different set of prices that would invalidate the original calculation. Thus, we cannot set the scale according to the criterion of efficient allocation, nor can we set distributive limits by the criterion of efficient allocation.

What, then, is the criterion for scale? Sustainability is the criterion for scale.

And what is the criterion for distribution? Justice is the criterion for distribution.

These, obviously, are not matters of market economics; rather, they are biophysical and cultural. They must be socially and politically determined, and thus, as a matter of policy, these decisions can be made more or less simultaneously. In strict logic, scale comes before distribution, because if there were no cap on total use the resource would be a free good, and the distribution of ownership of a free good would make no sense. Given these prior social decisions on scale and distribution, the market will determine allocatively efficient prices. Indirectly these prices will reflect the scale and distributive limits and therefore may be thought of as "internalizing" the values of sustainability and justice that have been previously decided politically, independently of prices.

Economists sometimes argue that scale is not an independent consideration—that if we had perfect information and could internalize all external costs and benefits into prices, then the market would automatically stop growth at the optimal scale. In other words, scale would have been subsumed under allocation. This has a certain plausibility if we accept the assumption of "perfect" information. However, if in the name of perfect internalization we insist that prices should incorporate the costs and benefits of different scales, we would also have to insist that prices reflect the costs and benefits of different distributions. But if we tried to use prices based on a given distribution as the means of measuring the costs and benefits of a change in distribution, we are again being circular.

Economics has clearly recognized the circularity and insisted that just distribution is one thing, efficient allocation another. Economists would not, for example, appeal to perfect information and advocate raising the price of things poor people sell or lowering the price of things poor people buy in order to internalize the external cost of poverty into prices. Instead they might advise us to redistribute income directly to attain a more just distribution, and let prices adjust. This also makes sense for questions of scale.

The way to get prices to reflect the values of just distribution and sustainable scale is to impose quantitative restrictions on the market that limit the degree of inequality in distribution of income and wealth to a just range, and that limit the scale of physical throughput from and back to nature to a sustainable volume. These imposed macro-level distribution and scale limits reflect the social values of justice and sustainability, which are not personal tastes and cannot be reflected in the market by individualistic actions. The market then recalculates allocative prices that are consistent with the *imposed* scale and distribution constraints, thereby in a sense "internalizing" these social values into prices.

Since it is circular to use prices to calculate optimal scale and optimal distribution, we need some metric of benefit and cost other than price (exchange value). As already suggested, this metric is the value of justice in the case of distribution; it is ecological sustainability, including intergenerational justice, in the case of scale. These are collective values, not individual marginal utilities per dollar equated among different goods in order to maximize satisfaction of individual tastes. If we reduce all dimensions of value to the level of subjective personal taste, then we cannot capture or bring to bear on the market the real weight of objective social values, such as distributive justice and ecological sustainability.

Controlling Throughput

If we are going to impose macro-level constraints on the market to control scale, we must ask: At which end of the throughput flow should we impose these constraints? We could impose restrictions at the output end (pollution), as in the SO_2 example. Or we could limit the input flow from nature (depletion). Since there are fewer mines and wells than there are tailpipes, smokestacks, garbage dumps, and outflow pipes into rivers, lakes, and oceans, it would be easier to put the control on depletion than on pollution. By the law of conservation of matter-energy, if we limit the inflow we will also automatically limit the outflow. Even if it is the outflow that is causing the immediate problem, even if sinks are more limiting than sources, the outflow may be more easily controlled by limiting the flow at its narrowest point, the inflow.

As a general rule it makes sense to control depletion directly, thereby indirectly controlling pollution. As with all general rules, there are exceptions. Although depletion limits provide a quantitative limit on pollution in a gross sense, many qualities of pollution could result from the same quantity of depletion. Depending on how resources are used, the same inputs could be converted into very toxic or very benign pollutants. Therefore, we cannot entirely concentrate on inflows and expect the outflows to take care of themselves. But inputs (depletion) should be our first control point.

PRICE VS. QUANTITY AS THE POLICY VARIABLE

In Chapter 21, we will look in detail at two basic approaches to limiting throughput: raising prices through taxation to reduce demand, or limiting quantity directly through quotas and letting prices adjust. Before we examine the specifics of each approach in detail, we investigate the effectiveness of the two approaches.

Given that we should mainly intervene on the input side, how should we do it? Should we try to control quantity and let the market determine the resulting price, or try to control price and let the market determine the resulting quantity?

THINK ABOUT IT!
Trying to control both price and quantity would be a bad idea. Can you explain why? Think of a demand curve.

If we can, by taxes, set the price where we want it, that will, via the demand curve, determine a corresponding quantity. Alternatively, if by quotas we set the quantity where we want it, that will, via the demand curve, determine a corresponding price. Theoretically, given a demand curve, we could get the same result either by fixing price or by fixing quantity (see Figure 20.1). How do we choose between them?

One point to bear in mind is that demand curves are uncertain and shift. So if we set the price, errors and omissions will result in quantity changes. If we set the quantity, errors and omissions work themselves out in terms of price fluctuations. Therefore, an important criterion by which to choose is: Where is it least painful to experience errors, as price changes or as quantity changes?

Because the ecosystem cares about quantities extracted and absorbed

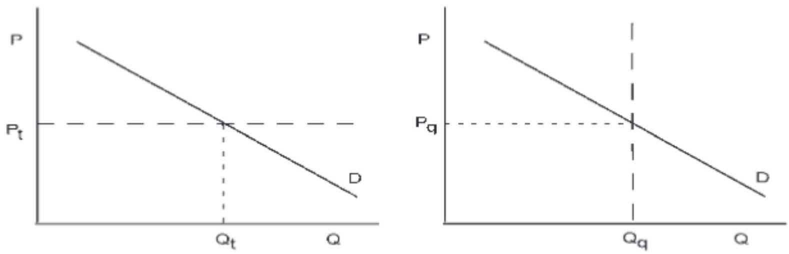

Figure 20.1 • Setting quantity with taxes and quotas. If taxes are set so that the price is equal to P_t, consumers will demand quantity Q_t. Alternatively, quotas could limit output to quantity Q_q, and for this quantity consumers are willing to pay P_q. It is possible, of course, to set Q_q so that $P_t = P_q$, or set P_t so that $Q_t = Q_q$.

and not the prices people pay, ecological economists have a preference for fixing quantity and bearing the adjustment cost of errors in terms of price fluctuations. That is ecologically safer, and more in accord with our design principle of leaving a big safety margin. It also follows more strictly the sequencing logic just discussed of setting the scale first outside the market and then allowing prices to be determined by the market.

The superiority of quotas for achieving desirable scale is even more evident when both global population and per-capita levels of resource use continue to grow. Such growth implies increasing demand for both sources and sinks. In the presence of quotas, the increased demand is reflected entirely by increased prices, creating ever-greater incentives to use resources more efficiently. If resource consumption and/or waste emissions are limited by use of taxes, greater demand will lead to both higher prices and greater consumption, unless taxes are continually raised. In a world of ecological thresholds and irreversible outcomes, taxes lead to a greater risk that we will eventually use up our slack.

We must also recognize that markets do not work as perfectly as we economists might like. In Chapter 19, we discussed financial panics and the tendency for people to follow herd behavior. In Indonesia, the Asian flu crisis led to an 85% depreciation of the currency over the space of weeks. Indonesia has a significant percentage of the planet's rainforests, which supply an abundance of important, nonmarket ecosystem services. Imagine Indonesia sought to internalize the value of these ecosystem services by taxing deforestation at the rate of 10 rupiah per board foot of timber extracted. Most of Indonesia's timber is sold on the global market, so the 85% depreciation in its currency would have implied an 85% decrease in the tax in relation to the trade currency. Even if the tax had been in U.S. dollars, the currency of international trade, most other costs of harvest are in rupiah. The 85% drop in all other costs would still reduce the price and increase demand, leading to greater deforestation. As we know from Chapter 6, greater deforestation can reduce the sustainable yield of the forest, and possibly even drive forest stocks below the point of critical depensation. A quota would not be subject to such irrational fluctuations in economic variables.

Source vs. Sink

As we have seen, before the market can operate, ownership of the newly scarce asset must be distributed. This raises many difficult issues, and it may cause a retreat from some of our earlier design principles in order to respect the last one—namely, that we start from historically given initial conditions. At the input end, most resources are already owned. At the output end, the atmosphere is not privately owned. A **source** is that part of the environment that supplies usable raw materials that constitute the throughput by which the economy produces and that ultimately returns as waste to environmental sinks. A **sink** is that part of the environment that receives the waste flow of the throughput and may, if not overwhelmed, be able to regenerate the waste through biogeochemical cycles back to usable sources. Sources are generally owned, and sinks are generally not owned. Directly controlling sources (depletion) involves more interference with existing property rights than controlling sink access. To socialize all resource ownership after resources are privately owned is revolutionary. To socialize the unowned sink, the atmosphere, and then charge a dumping fee seems less threatening to private property than a direct control over the amount extracted. But to control emissions is to dam the river at its widest point, contrary to the principle that it is easier to dam it at its narrowest point. Should we advocate revolution then? Most of us would not, but let's try to stick to our principle for a while at least.

What might be done to reconcile the principle of intervening at the depletion and with the difficulty that sources are private property? We might recognize that property is a "bundle of rights." The resource owner has to give up one stick out of that bundle—namely, the right to decide independently the rate of extraction of his resource. He still owns the resource and receives payment for whatever amount he extracts. But the scale of extraction is no longer a free good. It is socially limited to a national quota, and resource owners must bid at auction for the right to extract a share of the limited total extraction permitted. The scale limit may ultimately be set according to sink limits if they are more binding, but still enforced at the source end.

Alternatively, we could have a market in sink permits, capped at an aggregate scale. Suppose, in the case of fossil fuels, all users had to purchase emissions permits to burn whatever fossil fuel they purchased. This would indirectly limit demand at the source, and source owners would feel the pinch of scarce sink capacity—the scarcity of one complementary factor reduces the value of the other. This may appear less an infringement on the property rights of the source owners, since they have no claim to the sink, and it is the sink that is being directly limited. But the sink limit on the throughput is surely translated back to the input end. And since that sink limit will be experienced by source owners indirectly, even if we put the limit directly on the sink, why not go ahead and put the limit on the source in the first place? That would be the more efficient place to put it, even if it is the sink that is most scarce.

The other possibility noted is to fix prices through taxes and allow the market to set the corresponding quantity. Once again this is more efficiently done at the depletion end rather than the pollution end, but both are possible. The tax may be levied at the input end even though its basic motive is to limit the output. The advantage of taxes is administrative simplicity—we already have a tax system, and altering it is less disruptive than setting up a quota system with auctions. This is a significant advantage. On the other hand, taxes really do not limit quantities very strictly, and they maintain the false perception that there are no quantitative limits as long as one pays the price. As long as we pay the price plus a corrective tax, the message conveyed is that we can get as much as we want, individually and collectively. The quota, by contrast, makes it clear that the total quantity will not increase, and that all the price is doing is to ration the fixed quantity among competing users. The latter seems a more honest and truthful perception, since we are dealing with a scale-limited physical throughput, not income or welfare.

Policy and Property Rights

Before we begin to examine specific policies for achieving a more sustainable, just, and efficient world, we must discuss one of the core features of any policy: property rights. Concern over scale is concern over sustainability, and what is sustainability but the right to resources for future generations? If we believe there is a need for improved distribution, we are basically questioning the existing endowments of property rights. Finally, markets cannot efficiently allocate nonexcludable resources, and excludability is nothing more than a property right. Policy is largely concerned with creating, redefining, and redistributing property rights.

Property rights and excludability are not inherent properties of goods or services. No good is excludable, and no one has property rights unless a social institution exists that makes it excludable and assigns property rights (though we also know that it is not possible to make all goods excludable). A property right for one individual simultaneously imposes a duty or obligation on other individuals to respect those rights. For example, if person A has the right to breathe clean air, then person B has the corresponding duty not to pollute that air. The state ensures that person B will fulfill her duty. Property rights are therefore a three-way relationship between one individual, other individuals, and the state.[3]

In the absence of property rights we have privilege, or presumptive rights. If one person has privilege, he is entitled to behave as he pleases, and others have no rights. If a factory owner has privilege with respect to the atmosphere, he can pollute the air as much as he pleases. If others suffer from this pollution, then they must seek to change the prevailing lack of property rights.

When human populations and impacts were small relative to the sustaining ecosystem, the use of natural capital was appropriately characterized by privilege. Why not allow industries or individuals to pollute if few people lived nearby to be affected by that pollution? Why not allow industries or individuals to harvest fish or harvest trees if they existed in abundance? Why not give away rights to minerals to those who discovered them, as long as seemingly limitless virgin lands remain for future exploration? It makes little sense to establish property rights to superabundant resources.

However, as we know, the world is no longer so empty. The privilege to extract and pollute now imposes cost on others. This creates pressure to develop environmental policies that assign or modify property rights. Those who have privilege to extract or pollute are likely to defend the status quo, claiming that privilege as a right, when in reality it is an absence of defined rights. As we pointed out in Chapter 10, many economists have argued that it does not matter to whom rights are assigned; as long as rights are assigned, the market can efficiently allocate resources. We maintain, in contrast, that while the distribution of rights may not matter in terms of Pareto efficiency (i.e., Pareto efficient outcomes are possible for any distribution of property rights, though it will be a different outcome for different distributions), it matters profoundly for equity. We take the position that property rights belong to the people, as represented by the state, until otherwise assigned, and their distribution should be decided by a democratic process that respects future generations.

There are three important types of property rights, or entitlement rules, and rights to a specific piece of property may be affected by any combination of these.

1. An entitlement known as a **property rule** holds if one person is free to interfere with another, or free to prevent interference. For exam-

[3]D. Bromley, *Environment and Economy: Property Rights and Public Policy*, Oxford, England: Blackwell, 1991.

ple, an individual may own a piece of land. If he has the right to build a landfill that destroys the neighbors view, or to prevent the neighbor from walking across the land, he is free to "interfere" with the neighbor. Nor can the neighbor interfere with the landowner's landfill operation. If the neighbor wants to walk across the property or prevent the landfill from being built, the landowner's consent is required.

2. An entitlement known as a **liability rule** holds one person is free to interfere with another or prevent interference, but must pay compensation. For example, the landowner might be free to build the landfill, but by law he is then forced to compensate his neighbor for the smell, loss of view, and other disamenities. At the same time, the state could call on its right of eminent domain to take away the land from the landowner to build a highway and pay compensation at fair market price.
3. An entitlement, known as an **inalienability rule**, holds if a person is entitled to either the presence or absence of something, then no one is allowed to take away that right for any reason. There may be certain types of chemicals or products that are absolutely not permitted in the landfill, regardless of compensation. The negative impacts of these products are so severe that present and future generations have an inalienable right not to be exposed to them. Dioxins and radioactive waste would fall into this category.

Finally, we must remember that property rights need not be private property rights. Property rights can belong to individuals, communities, the state, the global community, or no one. While many conventional economists favor private property rights, we have already learned that private property rights are not possible in all circumstances (e.g., the ozone layer). In addition, many cultures have successfully managed common property resources for millennia. Almost all nations have certain resources owned by the state; recently, international agreements, such as the Montreal and Kyoto protocols, have recognized the need for ownership and management of some resources by the global community. The search for suitable policies neither can nor should be limited only to those that require private property rights.

Now that we have discussed basic principles of policy, appropriate policy sequence, high-leverage points of intervention, and the relationship between property rights and policies, we turn our attention in the next three chapters to some specific policies. We will more or less follow the policy sequence suggested above: scale, distribution, then allocation.

However, while in most cases we cannot hit two birds with one stone, some of the policies we look at are really a bundle of policies affecting all three goals. Other policies may hit one goal squarely while having an impact on another policy goal as well. Our division of the discussion is therefore not exclusive: All three goals will be discussed in each chapter, and policies are grouped only according to their dominant impact. Our three independent goals require three independent policy instruments in the same sense that solving three simultaneous equations for three different variables requires three independent equations; that is, one equation must not be derivable from the other two, and one variable cannot be the same as another, just expressed differently. Three simultaneous equations in three unknowns form a system, so clearly all three variables are interrelated—they are not independent in the sense that a change in one has no effect on the others (i.e., isolated) because they are clearly parts of an interdependent system. But they are independent in the sense in which each independent variable in a set of simultaneous equations requires an independent equation if the system is to be solvable.

BIG IDEAS to remember

- Six policy design principles
- Proper sequence of policies
- Source vs. sink as throughput control point
- Price vs. quantity as control instrument
- Circularity of internalizing scale or distribution in prices
- Property rights