

## CHAPTER 4

# Economic Growth and the Efficient Use of Resources

WE ARE, AS THE ANALYSIS IN CHAPTER 3 MAKES CLEAR, at the beginning of a decade during which claims on our productive resources will be unusually intense. In addition to continuously rising demands for goods and services for private and public use, urgent new claims on our economic resources have also emerged, such as the call for an improved environment. While the growth in our productive capability will also be rapid, 50 percent during this decade being a reasonable expectation, we must think in new terms about the deployment and organization of our economic resources if this growth is to be reasonably balanced. The purpose of this chapter is to explore selected program and policy issues that will require some new thinking if our economic system is to make its maximum contribution to national well-being.

The success of our economic system in achieving this goal requires that the full social cost be paid for the use of resources. Most of our productive resources are, of course, privately owned and can only be used if they are compensated according to their cost. The worker must be paid for his labor; the property owner expects a return for the use of his investment in land or productive facilities. Competition in the free market will normally lead to the optimal use of these resources. Under certain circumstances, however, the cost to society as a whole will not be the same as the private cost of the resources. For example, when a person drives his car during the rush hour he pays the cost of the gasoline he uses; but he pays none of the cost of the additional congestion he helps create, except to the relatively small extent that he himself is adversely affected. This means that resources may not always be allocated in a way which best serves the national welfare.

Social costs may exceed or fall short of private costs for many different reasons. For example, when there is no clear private ownership of a resource, the market cannot operate in such a way that the consumer pays the full social cost. When a monopoly controls a good or service, the price will tend to be above both the private and the social cost of production. Government regulation of prices or output can also force prices above or

below true social costs; examples in the fields of transportation and energy will be discussed in this chapter.

In cases where goods are overpriced or underpriced compared with their true social cost, their consumption patterns tend to be distorted and the value of national output is diminished. A striking example of this problem, recently and forcibly brought to public attention, is the underpricing of clean air and water in many communities. Because there are no property rights for the air and for most bodies of water, air and water have traditionally been treated as free goods to be used at no cost for disposal of wastes. This arrangement does not necessarily cause problems. As long as the wastes do not exceed its assimilative capacity, the environment itself performs valuable services free. But when the assimilative capability of the environment is exceeded, pollution imposes real physical and psychic costs on the community. Clean air and water are then no longer free for society as a whole. The growing number of such cases has led to numerous demands for Government action.

In other areas where Government has intervened to set prices for certain goods and services and otherwise to control their availability, the results have often prevented the efficient use of resources. Many Government regulatory policies, for example, were formulated under conditions which no longer exist, and these policies may have to be reconsidered if we are to have the growth and efficiency in our economic system to meet rapidly mounting claims on output.

## POPULATION GROWTH AND ECONOMIC GROWTH

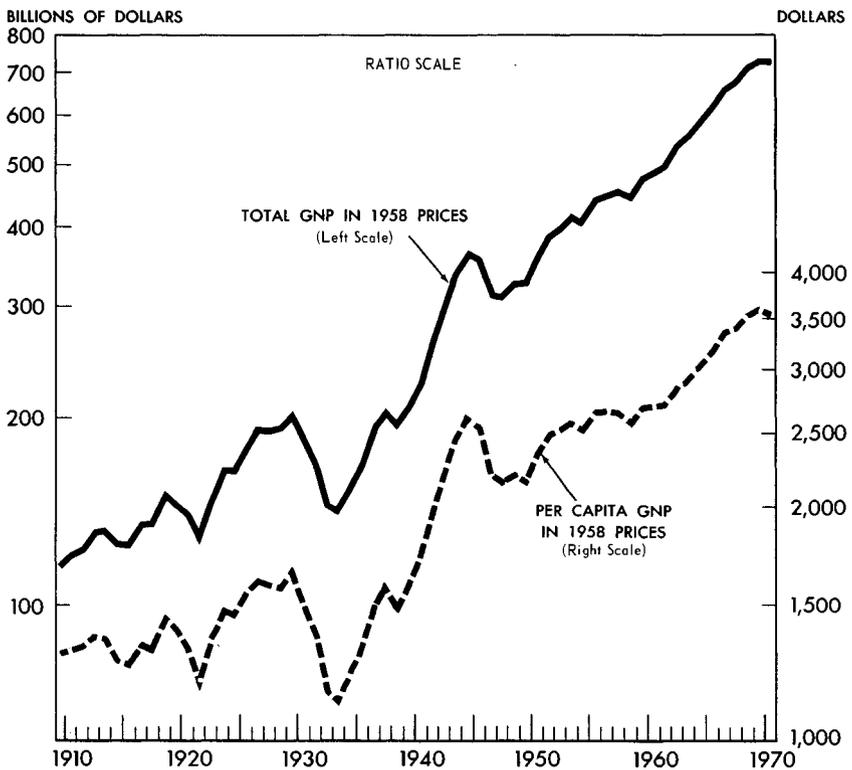
The growth of population and its concentration in metropolitan areas have raised increasingly urgent questions bearing on public policy and the efficiency and growth patterns of our economy. Historically, a growing and mobile population has been a major source of economic development in the United States. The waves of migration and the push westward encouraged by our early land settlement policies accelerated the process of converting an undeveloped land into the world's most productive economy. As the population grew and spread over the country, agriculture, transportation, manufacturing, and commerce expanded dramatically. Large markets stimulated production and permitted economies of scale to be realized. Although the population is now growing at a lower rate than in the past, the absolute increase continues to be high. The population has also remained unusually mobile, and this mobility has helped people find the jobs for which they are best suited. Along with industrialization, there has been steady migration to urban centers, where economic, social, and cultural opportunities are more abundant, but where new problems are being created. Conversely, the problems in many rural areas are those associated with a declining population.

## GROWTH AND SIZE: IMPLICATIONS

The magnitude of these changes is striking. Since the first census in 1790, the U.S. population has increased from 3.9 million to 205 million. Economic growth, as measured by real GNP, has proceeded even more rapidly than population growth. In the past 60 years, population has increased by 122 percent while real GNP increased sixfold, so that per capita real GNP increased by 171 percent (Chart 7). Historically, then, population growth has clearly not prevented a rapid rise in levels of living as reflected in GNP (see Chapter 3 for conceptual limitations).

Chart 7

### Growth in Real GNP, Total and Per Capita



SOURCE: DEPARTMENT OF COMMERCE.

The role of population growth in the country's future economic development is less clear cut. While population growth can be expected to lead to growth in total output, the key question is whether it will continue to bring about or be associated with growth in output per capita. With as large a population as ours and with our opportunities for trading with other coun-

tries, we may have exhausted many economies of scale. The past conjunction of rapid population growth and rapid economic growth does not imply that population growth is necessary for economic growth in the future.

Indeed many people are asking whether population growth may even be detrimental to further growth of output per capita or of some more comprehensive measure of individual well-being. While there appears to be no immediate threat, it is less clear that we can be equally sanguine about the next century. Population projections point toward a substantial further growth in the number of people. According to the "high" census projection, 321 million persons will be living in the United States in the year 2000, and the numbers will rise to 440 million in 2020. The "low" census projection estimates 266 million persons in 2000, and 299 million in 2020. Even if the fertility rate were to drop now to the level required for an eventually stable population, and no further immigration occurred, the population would not actually stabilize until the year 2037 because of the high proportion of young people in the present population. At that time, there would be about 276 million people in the United States.

Why are questions now being raised about the impact of population growth when such a rise in the numbers of people did not prevent, and indeed may have encouraged, the Nation's economic growth during most of its history? The present concern centers on the limited supply of certain types of resources. While it is impossible to specify the future adaptations in technology and consumption patterns that will conserve resources, past experience indicates that many unforeseen ways of meeting demands will be found. But some natural resources could become much more costly than they are now. Costs have risen, for example, as poorer deposits of minerals have been extracted and as water and other resources are recycled. The costs in terms of environmental damage, or in terms of the resources used to prevent such damage, will also increase. Certain natural scenic areas are almost fixed in supply; and, as they become more crowded, they may provide less enjoyment for those who use them.

Some of these problems will arise because of our increasing affluence, not because there are more people. Even by the year 2020 the high census projection would give us a population density of only 124 persons per square mile, about one-fourth that in Western Europe today. Each person will, however, demand more manufactured products, more housing, more transportation, more recreation, and more services, and this will affect environmental conditions. Rising affluence is at least as important as a growing population in creating additional demands on the supply of natural resources. At the same time, increased affluence makes it easier to bear the costs that thereby arise. The same factory that could well be denied a place in a rich country because it creates pollution would be welcomed in a low income country because it creates jobs. And more costly production processes which cause less pollution can be used in factories that do locate in a rich country.

## POPULATION DISTRIBUTION

Many of the problems that are commonly attributed to excessive population in the United States are actually caused by uneven distribution (Chart 8). We now have only 58 persons per square mile, about one-eighth of the density in Western Europe and less than one-tenth of Japan's. The density of the population, however, varies greatly within the United States. It ranges from 5,327 persons per square mile in the New York City area to 3.4 for Wyoming, and Alaska has only one person for each 2 square miles. Although areas with the lowest density at present have always been sparsely populated, the population of many rural areas has declined. The proportion of the population living in urban areas has been increasing steadily and now comprises more than 70 percent of the total.

An important factor in the changing distribution of population is the shifting composition of national output. When the country was largely agricultural, settlement was heavily influenced by the distribution of arable land. A substantial share of the population not employed directly in agriculture was employed in serving the agricultural population. Because of high transportation costs these persons located close to the farming areas. A multitude of small centers served the everyday needs of farmers, while larger, more widely spaced centers undertook activities which were needed less frequently or in which there were substantial economies of scale. As with agriculture, clusters of people also developed around such natural resource industries as forestry, mining, and fishing.

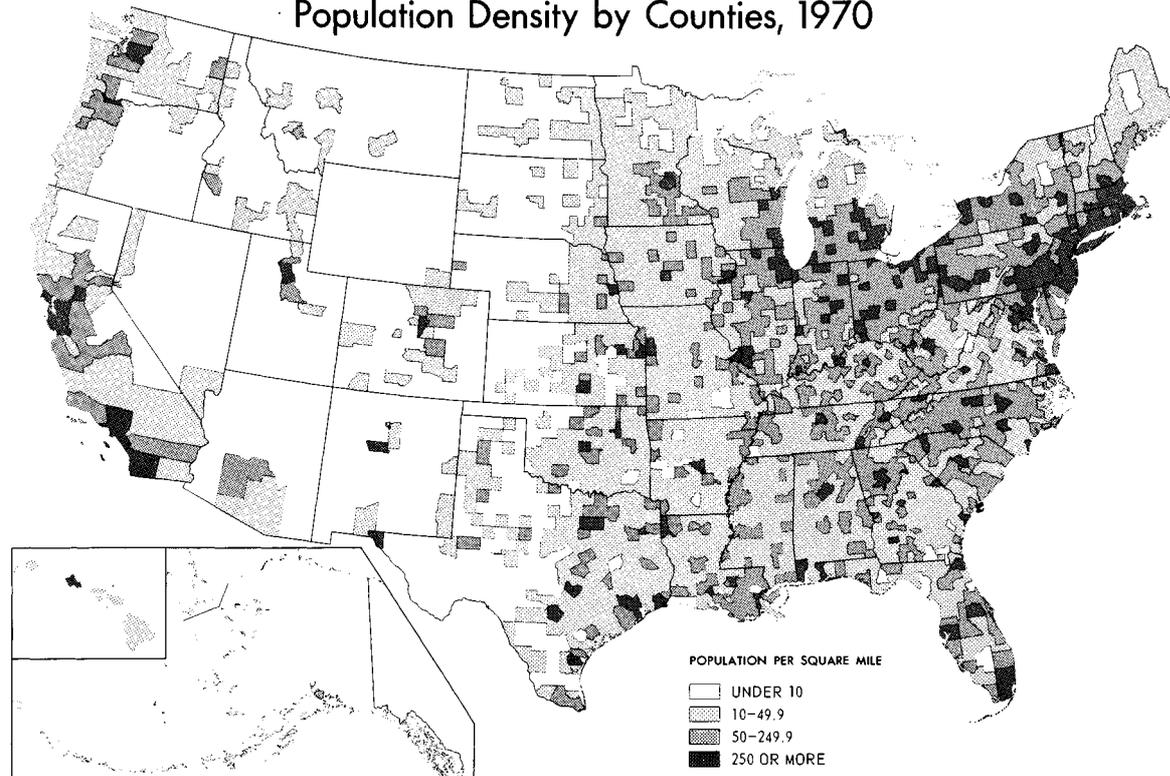
These primary industries no longer have a major influence on the distribution of population. The farm population, for instance, is now less than 5 percent of the U.S. total, compared to 15 percent in 1950 and 35 percent in 1910. The relatively slow growth of industries dependent on natural resources, the efficiency with which people and goods can be moved, and the more rapid expansion of manufacturing and service industries have encouraged further expansion of the already large population centers. These centers provide opportunities for specialization and economies of scale that would otherwise be impossible.

The distribution of populations within cities is also affected by changing cost factors. The lower the cost of transportation and the higher the value of spacious living, the more people will spread out around centers. As people spread out to the suburbs, industries follow. The factors that affect the distribution of people and jobs tend to reinforce each other. Jobs move in search of people and people move searching for jobs. As a result an initially small change in activity at a center can eventually have a large impact on its size.

The consequences of the tendencies discussed above can be seen in the population statistics. The population of the 24 metropolitan areas of more than a million people in 1960 grew 14 percent between 1960 and 1970, as compared to 10 percent for the remainder of the country. Metropolitan areas with more than a million persons now contain 39 percent of the total

Chart 8

# Population Density by Counties, 1970



SOURCE: DEPARTMENT OF COMMERCE

population. At the same time, the population within metropolitan areas is shifting from the central city to the suburban fringe. Fifty-seven percent of the people in metropolitan areas of more than a million lived outside the central city in 1970, compared to 51 percent in 1960. In 1969, families living in metropolitan areas of a million or more had average incomes 13 percent higher than those of families in smaller metropolitan areas and 37 percent higher than those of families outside metropolitan areas. (These figures do not take account of differentials in living costs.)

Concentration of people and economic activity, however, involves costs as well as benefits. Unless actions are taken to offset the effects of concentration, traffic congestion and air pollution increase with city size. Commuting time rises and recreation areas become less accessible. Expenditures for police protection, welfare, and waste disposal are higher per person in very large cities than in smaller ones.

These costs of larger cities do not necessarily mean that cities should be smaller. The fact that people continue to move to large cities implies that they believe they can gain more there than the costs they incur, though costs imposed on others, such as higher welfare payments or increased congestion and pollution, may make large concentrations inefficient. If cities are too large to be efficient or are poorly organized, the problem can be traced in large part to a failure to charge people for all the costs they impose or to reward them fully for the benefits of their action.

Traffic congestion provides a clear example of problems that arise when costs to users fall short of total social costs. When congestion occurs, every additional car on the streets increases travel costs for all other vehicles. Yet no driver is required to pay for these costs that he imposes on others. Nor is there any compensation for a person who leaves the streets, permitting others to travel faster. A more efficient use of streets would occur if people were to pay in some way for the consequences of their actions. It has been suggested, for example, that people should have to buy special permits to operate cars in congested areas during rush hours, or that a charge for congestion might be collected through parking lots.

The movement of population to metropolitan areas also creates problems for declining rural areas. As population density falls, the range of goods and services offered in an area shrinks. The outmigration of working-age people lowers per capita incomes and makes it more difficult to finance social services. Because of declining travel costs, more and more people who work in outlying areas live in nearby small cities, though the opposite also occurs. As the labor markets in these cities attain a sufficient size, they may also attract industrial employers. Some small cities are already experiencing rapid growth as many business operations and government facilities have been located in such areas.

Last year the President appointed the Commission on Population Growth and the American Future. The Commission is now examining how population growth will affect the quality of life and how all levels of government

can best respond to the demands posed by population growth and its distribution. Its work should help the Nation to make better choices among alternative ways of using some scarce resources.

## SAFEGUARDING THE ENVIRONMENT

As the economy grows, more waste of various types is produced. This does not cause major problems as long as the population is widely dispersed and the environment is not overloaded. As the population is increasingly concentrated in urban areas, however, the assimilative capacity of the environment in these areas tends to be exceeded. It then becomes more and more important that these limited environmental resources be used to the best advantage.

While it might be tempting to say that no one should be allowed to do any polluting, such a ban would require the cessation of virtually all economic activity. Since society places a value both on material goods and on clean air and water, arrangements must be devised that permit the value we place on each to determine our choices. Additional industrial development, increased use of pesticides on farms, and a growing volume of municipal sewage mean dirtier water downstream and fewer opportunities for recreation. On the other hand, stricter rules for pollution control generally mean either higher taxes or higher prices for goods. What we seek, therefore, is a set of rules for use of the environment which balances the advantages of each activity against its costs in other activities forgone. We want to eliminate pollution only when the physical and aesthetic discomfort it creates and its damage to people and things are more costly than the value of the good things—the abundance of industrial or farm products and efficient transportation—whose production has caused the pollution.

One of the ways that the competing claims on environmental resources could be balanced is through the development of “new towns” and resort communities. In these cases, a developer essentially buys title to a whole community’s environment. He then has an economic incentive to avoid excessive damage to that environment. If, for example, he lets a factory buy the right to locate in the community even though it would substantially damage the community’s environment, the value of potential residential property will thereby be lowered. Only when the advantages of industrial activity, such as increased income, outweigh the environmental disadvantages would the developer permit the factory to locate there. The same incentives would operate to limit pollution from such activities as municipal waste disposal.

The concept of unified development does not provide much guidance for solving pollution problems in areas that are already developed. With substantial capital invested in existing industrial facilities, a company that must pay large additional costs for pollution control may find continuing operations economically infeasible. A major change in liability for pollution costs may, in effect, expropriate the capital of some even while it

enhances that of others. Nearby homeowners, on the other hand, may feel that pollution has always been harmful, and that its existence in the past does not justify its continuation.

This kind of dispute is central to the pollution problem and has become increasingly widespread as the various users of air and water seek to assert their claims to the limited environmental resources. A solution requires procedures and rules for the use of clean air and water that permit an orderly settlement of the competing claims on these limited resources, and that take account of the fact that these resources are not inexhaustible. The homeowner, the factory owner, and the farmer cannot simultaneously enjoy unlimited use of air and water. Industry and agriculture must recognize the new sense of urgency and concern about environmental problems. At the same time we must not overlook the fact that people also want more and more of the jobs and products of farms and factories.

### SOCIAL ROLE OF PROPERTY RIGHTS

Problems similar to those arising from pollution have frequently been handled by granting private title to limited resources. Agricultural and forest land were once common property with poorly defined usage rights. As demands on these resources grew, their use by one party inflicted damage on others. The adjudication of conflicting claims to these resources by granting private title to them served the important social purpose of providing an incentive for these resources to be used more efficiently.

Air and water resources are harder to divide into meaningful private parcels than land. If each landowner had title to clean air around his property, a factory in New York that would emit air pollutants might have to deal with 8 million "property owners," making it difficult to operate any factories at all.

Because private property arrangements cannot be applied generally to our air and water resources, environmental problems connected with their use have to be solved within a framework of common property. The procedures and rules that we develop for resources regarded as common property must encourage their efficient use, just as would be true if they were private property.

A set of rules for the efficient use of air and water should not only permit no more fouling of air and water than we wish to tolerate, but it should also ensure that the tolerated degree of pollution occurs for the most productive reasons. The rules should also encourage the use of resources to limit the damage done by the pollution that is allowed. Finally, the rules and procedures should not themselves entail a higher cost of administration and enforcement than the cost of having no rules.

#### *Specific Rules*

As our society has become increasingly aware of the conflicting claims on air and water, specific rules have been developed for the use of these

resources that recognize their limited nature. As early as 1899 a Federal law was passed regulating the disposal of waste in rivers and harbors. However, only with recent legal opinions and legislation has it become clear that the law could be used to reduce pollution, and the President has recently issued an Executive Order to use the law in this way.

Two problems must be faced in setting up rules for use of the environment. First, it must be decided how much pollution, if any, will be tolerated and under what circumstances changes in this amount will be permitted. Toward this end, the Federal Government has established the Environmental Protection Agency. This Agency, together with State and local authorities, develops standards for ambient air and water quality. These standards are statements of environmental quality goals considered desirable for particular areas or for the Nation as a whole. Since past arrangements, which imposed no cost on those who polluted the environment, led to excessive pollution, these air and water quality goals have uniformly sought reduction of pollution. Once such goals are developed, the next problem is to devise a system of rules for attaining them. Particular polluters must be led to change their actions so that, in fact, less pollution is produced. The Federal Government and other authorities have also been active in devising rules to implement attainment of environmental goals.

Foremost among the new rules has been the setting of Government standards applicable to particular pollution sources. Under this system, the Government requires that each source reduce its emissions of pollutants by an amount sufficient to keep the total of all emissions within the environmental quality standard. All sources are ordinarily required to reduce emissions by the same percentage. For example, under recently enacted amendments to the Clean Air Act of 1967, cars of the 1975 model year will have to reduce emissions of carbon monoxide and hydrocarbons by 90 percent from 1970 levels. While such Government standards have been applied most extensively to automobiles, similar standards are now being developed and implemented for other pollution sources.

This system of Government standards provides one mechanism for attaining environmental goals that recognizes the increasing scarcity of environmental resources. If this system is to generate efficient results, the goal must, of course, be appropriate. That is, the control of emissions that is required at each source must produce a high enough quality of air and water so that further improvements is not worth the costs of further control. If Government standards are to achieve the best use of environmental resources, there must also be substantial uniformity of the cost of control among pollution sources. Where these costs differ, the same environmental quality could be attained more cheaply by having the source with low control costs undertake more control than the source with high costs; but this would not occur if uniform standards were applied to all sources. The standards might, of course, be made nonuniform to account for differences in control cost, but only at considerable administrative cost because the

Government agency setting the standards would need detailed knowledge about many different pollution-causing activities. It is also difficult politically to set variable standards. Many, including of course the owner, would think it unfair to penalize a plant with low control costs for its efficiency in pollution control by imposing an especially tough standard on such a plant.

Differences in control cost were perhaps an unimportant problem when attention focused on automobile exhausts. While there are some differences among types of cars in the cost of controlling exhaust emissions, the common technology of the internal combustion engine limited these differences and seemed to justify the application of common standards to all cars. In other cases a pollutant may prove so damaging that a common standard, namely, an outright ban on all discharges, would also be called for even if there are differences in control costs. However, as attention focuses on industrial and agricultural pollutants that are not to be eliminated completely, differences in control cost will prove to be more of a problem. Particular pollutants are emitted from sources with diverse processes, sizes, and ages; and large differences in the cost of control can be expected. For example, sulphur oxides, which are one of the most damaging pollutants of the air, are emitted by electric powerplants, steel mills, nonferrous metal smelters, and home-heating systems. The differences in the size of these sources and the diversity of their processes make it almost certain that a given reduction of sulphur oxides cannot be accomplished at the same cost at each source. It is already known that there are economies of scale in sulphur oxide abatement, so that, for example, a given degree of control could be attained less expensively at one large powerplant than in many home-heating systems.

One way that differences in control costs could be taken into account would be to set "prices" for the use of the air and water. If each potential polluter were faced with a price for each unit of pollutant he discharged, he would have to compare this with the costs of pollution control in his particular circumstance. If control costs were relatively low, he would engage in extensive control to avoid paying the price being charged for polluting. If control costs were high, less control would be undertaken. Since sources with low control costs would carry out more than average control and those with high control costs less than average, a given level of environmental quality could be attained with expenditure of less productive resources than if all sources had to meet a common standard. At the same time, discovery of new techniques to control pollution would be encouraged, because every reduction in pollution would lower the payments for the right to emit pollutants. Of course, a price system, like a system of standards must be employed in a way that is consistent with environmental goals. The right to use air and water must be priced high enough so that the abatement encouraged improves the quality of the environment enough to justify the abatement expenses, while further improvement would not be worth additional expenditures.

There are three methods by which prices may be established for use of air and water: subsidies for control of pollution, charges for emissions of pollution (also called effluent fees), and sales of transferable environmental usage rights.

In the case of pollution abatement subsidies, the "price" paid by the polluter is the subsidy he forgoes. The more he fouls the air and water, the less he receives in subsidies. This approach can attain the efficiency inherent in a price system, but it entails substantial administrative as well as fiscal costs. In order to keep its subsidy payments down, the Government agency will have to incur the expense of ascertaining the level of pollution that would have occurred without any pollution control. As new products and processes are developed, this administrative task would grow more expensive, because in their case no record of past pollution would be available.

Alternatively charges could be levied on pollution. A charge on emissions of harmful substances would limit the amount of emissions indirectly. The higher the charge, the more a polluter would be willing to spend to avoid contaminating the environment (and thereby avoiding the charge). Another alternative would be an environmental usage certificate system. It would limit the amount of pollutants directly, but allow the price for pollution to be set indirectly. Under this system, as under a system of pollution standards, a Government agency would set a specific limit on the total amount of pollutants that could be emitted. It would then issue certificates which would each give the holder the right to emit some part of the total amount. Such certificates could be sold by the Government agency at auction and could be resold by owners. The Government auction and private resale market would thus establish a price on use of the environment. The more pollution a user engaged in, the more certificates he would have to buy. Groups especially concerned about the environment, such as conservation groups, would have a direct method of affecting the environment. They could themselves buy and hold some of the certificates, thus directly reducing the amount of emissions permitted and increasing the cost of pollution.

In general, any choice between emission charges and usage certificates should depend on which is easier to determine: the right price for pollution or the right quantity. If the amount of damage done by a pollutant can be measured easily and it appears that each unit of pollutant does roughly the same damage, an emission charge would be called for. If the damage per unit of pollutant may rise substantially with higher total emissions, a usage certificate system would be in order. Both the charge and the certificate approach would, like a system of standards, reduce the total amount of air and water pollution. However, by introducing a price mechanism, charges or certificates would allow the limited amount of tolerable pollution to be allocated efficiently when differences in the cost of control are present. Such efficiency would reduce the resource cost of pollution control and would

therefore enable us to afford cleaner air and water than we could if common standards were imposed in the face of differences in control costs.

Pollution charges and certificates have not yet been widely used in this country, though some municipalities have levied charges on industrial sewage discharge. A system of water pollution charges has been used in the Ruhr basin for some time, and new proposals for pollution charges have been advanced in this country. This Administration has already proposed a tax on lead additives in gasoline which reduce the effectiveness of certain devices used to control auto exhaust emissions. This tax should encourage drivers to switch to unleaded or low-lead gasoline, refiners to produce such gasoline, and carmakers to equip their cars with the low-cost catalytic filters which work only with unleaded gasoline.

There is currently under study a charge on atmospheric emissions of sulphur oxides from combustion of fossil fuels. This charge would be sufficiently high to encourage substantial control of sulphur oxide emissions, and the consequent reduction of damage to health and property should substantially exceed the control costs.

A charge on sulphur oxide emissions provides a good illustration of one of the important benefits of a price system—namely, the information produced by prices about the most efficient way of handling pollution problems. Sulphur oxide emissions are now regulated by Government standards. The State of Washington, for instance, has proposed a standard whereby copper smelters there would be required to control 90 percent of the sulphur content of copper ore entering smelters. This, according to a study done for the State, could be accomplished at a cost equal to about 2 cents per pound of copper (about 4 percent of the price). The copper smelters there, however, claim that such a level of control is technologically impossible to attain, and that imposition of the standard would force the smelters to close. Such disputes over Government standards are not surprising where there is uncertainty over control costs. Advocates of the standard will tend to minimize its costs so that the chances of having the standard adopted are increased, while those facing the burden of complying with the standard have an incentive to overstate the costs so that chances are improved of having the standard, and hence their costs, lowered. In the absence of accurate independent information on the costs of control, such disputes are difficult to resolve.

Much of the gap in information could be eliminated quickly if an emission charge were instituted. If, for example, a charge were applied to smelters equivalent to 3 cents per pound of copper when emissions were not controlled, then with 90-percent control the smelter would save about 2.7 cents in charges per pound of copper produced. If this 90-percent control could indeed be achieved at a cost of 2 cents per pound, the smelter would not hesitate to incur such costs and thus avoid the larger charge. If, on the other hand, 90-percent control were “technologically impossible” or cost much more than 2.7 cents per pound, the smelter would engage in less complete control. Perhaps 80-percent control could be achieved more

cheaply than the 2.4 cents in payments which this control would save. However, the company would still have an incentive to find new control methods that might be less costly than its remaining tax burden. Not only would the factual dispute be settled by this charge but incentives would be created for an efficient response to an environmental problem.

While transferable environmental usage certificates have the same kind of efficiency advantages as emission charges, they have not yet been applied to the solution of environmental problems. One area where their use may merit attention is the control of offshore dumping of waste, which constitutes a growing hazard to the environment. It is feared that damage, especially to food sources, may escalate sharply unless steps are taken to limit the waste dumped into the ocean. At the same time, the cost of alternative means of waste disposal differs among the many current users of the ocean. Ocean dumping could be limited and individual differences in the cost of control of dumping taken into account under a certificate system. This would require that anyone who wished to dump wastes in the ocean have a Government license to do so. The license would specify the amount and type of material that could be dumped at a particular ocean site, and the number of such licenses would be limited to permit no more dumping activity than is considered safe. These licenses could be auctioned off by the Government, and sold later by a purchaser who no longer required them.

The Administration has proposed legislation under which licenses will be required for ocean dumping. A possibility worth considering is to make such licenses transferable. If this were done, prospective ocean dumpers would either have to pay the going price for licenses or find a cheaper way of disposing of their waste products. Those who were able to find such alternatives would not buy the licenses; those for whom alternatives were very costly would purchase them. The Government's prime concern should, of course, be limited to the total amount and kind of dumping, not who is doing it.

As choices are made between applying Government standards and instituting prices, the grounds on which the choice is made must be kept clear. Prices for pollution have, for example, been regarded by some as a form of evasion of standards, as a "license to pollute." Actually every system of rules for use of the environment, other than outright and total prohibition of certain uses, involves granting someone the right or "license" for some polluting. The amount of pollution that results does not depend on which system of rules is adopted, but on how each is administered.

It is sometimes said that administration of emission charges is unduly complicated, since they must be varied continually as pollution damages change, and they require close measurement of the pollution against which the charge is to be made. When damage estimates can change frequently, administration of a system of charges can become costly, and a certificate or standard system would save this cost. However, the cost of measuring pollution is not unique to a charge or certificate system. It would be just as

great if standards are to be enforced. If measurement of pollution is too expensive to permit an effective system of standards, charges, or licenses, we face a choice between outright prohibition of the pollution, tolerating the present level, or requiring adoption of some conventional control procedure.

### *Problems in the Application of Rules*

As rules for the use of common property are developed, whether these are embodied in Government standards, emission charges, or usage certificates, several problems will have to be resolved. We shall, for example, have to decide at what level of Government the rules will be made. Since these rules require that the gains and losses entailed by different levels of environmental quality be weighed, the Government agency making the rules must be responsive to those who bear the gains and losses. This is especially important because part of the damage from pollution cannot be measured directly but depends on such things as the aesthetic preferences of those affected. As a practical matter, much of the damage from pollution will be "measured" by political pressures from those damaged. Many, though not all, pollution problems are local in character, and therefore determination of the appropriate level of environmental quality in these cases is likely to be more accurate if it is done locally rather than by the Federal Government.

Where the environmental effects of a particular activity are in fact nationwide, as is true when poisons enter the food chain in a river and eventually damage fish caught in a distant waterway, the Federal Government must ensure that certain minimum standards are set. Some degree of uniformity may also be desirable where the cost of altering a given production process or product to meet differing local standards is great. It is not clear, however, that the Federal role should extend beyond the setting of such minimum standards where most benefits and costs of pollution are borne locally. In such cases, a pollution source generates income as well as pollution damage in the community where it is located. The seriousness of the damage will depend in part on such local factors as topography, wind patterns, and population density; and the right amount of control will depend on how much income would be lost to achieve abatement. It would not be sensible to impose the same abatement costs on a factory or farm located in a lightly populated area or where the environment has substantial assimilative capacity as on one in an area without these favorable characteristics.

Where environmental damage crosses local political boundaries but is not national in scope, the appropriate Federal role might be to foster the creation of interstate agencies, such as regional air quality boards and river basin authorities, which would be responsible to residents of areas affected by common environmental problems. The recent amendments to the Clean Air Act of 1967 will permit interstate air quality agencies to set regional

air quality standards, which will have to meet minimum Federal standards. It is important, however, that these minimum standards permit these agencies to adopt standards appropriate to local circumstances.

New rules for use of the environment are bound to affect competitive relationships within and among industries, localities, and nations. As industries are forced to bear the costs of using the environment, those who have high costs will lose part of their market to those with lower costs of using the environment. Inevitably, there will be pressures for Government action to prevent this reallocation of production. It should be realized, however, that such reallocation is necessary if environmental resources are to be used efficiently. Government interference with this process should therefore be limited to mitigating the transitional effects.

The same considerations apply internationally as well as domestically. Our high level of material wealth has caused us to place a higher value on clean air and water than they are assigned in countries which have lower incomes or where clean air and water may still be abundant. As this value becomes reflected in the costs imposed on our producers, those for whom the costs of pollution control are high will find it harder to compete with producers in countries where clean air and water are less valuable or where pollution is lower. The resulting reallocation of production among nations should benefit all nations. We will tend to concentrate on the production of goods which make small added demands on our valuable environmental resources, while other countries will produce goods which increase the use of their relatively abundant environmental resources or whose lower incomes make growing industrialization more urgent than extensive control of damage to their environment. International agreements to restrict this reallocation would, however, be desirable when pollutants emitted in one country damage residents of another.

## TRANSPORTATION

Even as Government creates new rules and institutions to promote an efficient use of resources, it must constantly examine the utility of its existing institutions. The transportation industry is a case where special care must be taken to assure that Government policies do not promote inefficiency by permitting private costs to diverge unnecessarily from social costs.

The transportation industry is important both to the Nation's rate of overall growth and to the way that this economic activity is distributed geographically. Much of this industry is subject to Federal and State regulation instituted under conditions that no longer exist. Such regulation today may be one factor that interferes with an efficient use of resources in transportation, and it appears that regulatory patterns may have to be reexamined if the industry is to contribute its full potential to the Nation's welfare. While the focus here will be on regulation, this is not the only Government policy that creates a divergence between private and social costs. Inland waterways, for example, are developed and maintained out

of general tax funds. There is no direct charge levied on the barge operators who use them. Many barge rates consequently fall short of the social cost of such traffic and lead to uneconomic diversion of traffic to barges. In addition some States have laws that inhibit the efficient utilization of labor on railroads.

## SURFACE FREIGHT TRANSPORTATION

When the Interstate Commerce Commission (ICC) was established in 1887, the railroads had a near monopoly of freight transportation. Public demand for control of this monopoly was one of the factors leading to the creation of the Commission. Another source of pressure for railroad regulation, however, may also have played a role in the development of ICC regulation. While railroads as a group had a near monopoly of freight traffic, there were often several railroads along the same traffic routes. The absence of antitrust laws made it attractive for rival railroads to collude among themselves in setting rates. As is frequently the case, such private cartels tended to break down when some members secretly reduced rates to lure business away from others. The railroads themselves supported the establishment of a Government agency that would end the instability of these private rate cartels. The powers given to the ICC in 1887 and subsequently may therefore not have been designed primarily to promote competition among railroads.

The ICC now regulates all rail traffic, 39 percent of truck traffic, and 10 percent of inland water traffic. The regulation is comprehensive, covering rates, types of service offered, and the ability of firms to enter and leave the industry or particular markets. While groups outside the transportation industry do influence the exercise of the Commission's powers, the main thrust of regulation has been to ameliorate the effects of competition among the carriers and to mediate competitive disputes among them.

Early attempts by railroads to eliminate rate competition under regulation were not completely successful. Early in the 20th century, therefore, and with the support of the railroads, the ICC was given power to approve minimum rates—rates below which a particular railroad could not go. The railroads used this power to institutionalize the value-of-service rate structure whereby goods of higher value were charged the highest freight rates even if it cost no more to carry them. Private costs to shippers were thus allowed to diverge from the social costs of transportation. This rate structure was most profitable to the railroads at the time, but its institutionalization under minimum rate regulation eventually became a source of their present problems.

The value-of-service rate structure helped expose the rails to competition from trucks. Because rates did not correspond to costs there were substantial differences in the profitability of carrying different goods. New trucking companies saw the prospect of capturing some of the profitable high-rate traffic from the railroads. With the spread of the highway network, the then

unregulated truckers undercut rates on the high-rate traffic and diverted some of it from the rails.

This reduced the profitability of the railroads and they argued for suppression of the truck competition. In 1935, ICC regulation was extended to cover much of intercity trucking (and barge traffic in 1940). In order to resolve the competitive dispute between rails and trucks, the existing rate competition was suppressed. The value-of-service rate structure was carried over from rails to trucks. At the same time, minimum rate regulation was applied to all common carrier motor carriers, so that existing rate competition between trucking firms was reduced. All carriers were left to compete on nonprice grounds, such as speed and the quality and frequency of service.

As the highway network grew, however, trucks continued to attract high-valued freight from the rails. Much of this was manufactured goods, where superior service offered by trucks frequently gave them an advantage. Thus the railroads' share of the freight market continued to fall. From 1939 to 1969, their share of intercity freight traffic fell from 62 to 41 percent, while the truckers' share rose from 10 to 21 percent. At the same time, the railroads became more heavily dependent on low-valued, low-rate traffic.

### *Inefficiencies Due to Regulation*

This shift of traffic from railroads to trucks did not always come about because trucking costs were below those of the rails. Part of it occurred because the value-of-service rate structure was unrelated to the costs of transportation. Even on long-haul traffic, where rail costs are much below truck costs, a shipper would frequently choose to ship by truck if trucks offered better service. By preventing carriers from fully reflecting cost advantages in their rates, regulation maintained high-cost transportation. In some rate cases where a low-cost carrier sought to exercise its advantage by offering a lower rate, the ICC prevented this so that the high-cost carrier would not be damaged financially, even though the public interest would have been better served by lower rates. More recently there has been some increase in competition between modes of transportation, but the ability of carriers to set minimum rates in concert continues to suppress competition among railroads and among motor carriers.

The application of the value-of-service rate structure to all modes also contributed to the problems of rural depopulation and metropolitan congestion which were mentioned earlier. Under the value-of-service rate structure, rates on finished goods tend to be higher than those on raw materials. These higher rates on finished goods give manufacturers an incentive to locate close to or in the metropolitan areas where their major consumer markets are found, rather than in the areas where raw materials are produced.

The preservation of value-of-service rates also induces excessive reliance on unregulated private or contract carriage. Wherever regulated rates are held above costs, some shippers have an incentive to buy or rent their own vehicles, usually trucks. This may save money for the shipper even if the cost

of operating these vehicles is above the cost to the regulated carriers, as it might be because under present regulations these trucks must often return empty to the shipper's location. These added costs represent wasted economic resources.

Transport regulation extends beyond rates. Under existing legislation, a firm that seeks to enter the industry or a particular market must first obtain a certificate from the ICC. This has protected existing carriers from competition because new carriers have not been permitted to enter freely even if they could meet safety and reliability standards. This restriction of entry has inhibited the formation of new trucking firms, though trucking is the most rapidly growing form of regulated surface freight transportation. Further, a certificate to enter a market often contains numerous service restrictions designed to protect established carriers. There are, for example, restrictions on the commodities which may be carried and the number of towns between two points which may be served. In the absence of these restrictions, the same service could be performed equally well by fewer trucks.

This restriction of competition has had in the long run an increasingly adverse effect on many of the intended beneficiaries, especially the railroads. With rate competition among carriers minimized, carriers sometimes strive to gain customers by having the most equipment available and offering the most frequent service. This is one reason why the transportation industry as a whole has had more capacity than the total traffic requires; another reason is to be found in the obstacles to abandonment of unprofitable service. The costs of carrying this excess capacity have in turn tended to dissipate some of the financial gains to carriers that resulted from suppression of rate competition.

### *An Alternative to Regulation*

The development of the transportation industry under regulation suggests that the public as well as large sections of the industry would be well served by relying more on the forces of competition. The rationale for regulation found in the railroads' monopoly position in the 19th century has become increasingly obsolete. Transportation could be a viably competitive industry today since most shippers already have a choice among modes, and with fewer entry restrictions they would have more choice among carriers. By frustrating this potential for competition, regulation appears to have promoted high freight rates and numerous inefficiencies, and in the long run to have weakened firms financially. This raises the question of whether the introduction of competition in transportation may require fundamental institutional reform. Legislative attempts to promote competition under the present regulatory system have had only limited success. This is illustrated by experience with the Transportation Act of 1958, which sought to increase competition among trucks, rails, and barges within the present regulatory framework. While such intermodal competition has in-

creased somewhat, it has often not been permitted when the financial viability of some carrier was threatened.

If it appears that the full benefits of competition can not be attained within the framework of the existing regulatory process, substantial deregulation of surface freight transportation may have to be considered. This approach would involve the removal of regulatory obstacles to competition so that free market forces would ultimately be allowed to establish prices and allocate resources in the same way that they do in other industries. In view of the magnitude of the changes that would be brought about by such deregulation, it would probably be advisable to introduce competition gradually. Carriers, for example, might initially be given freedom to set rates within a narrow band above and below the present regulated levels, and this band could widen over time. Freedom to enter markets could be initiated by removal of the service restrictions on existing ICC truck certificates and of the restrictions on intermodal ownership by existing carriers. At some future point, restrictions on entry by new firms could be lifted. Restrictions against carriers' leaving unprofitable markets could also be lessened gradually by, for example, permitting them to abandon without ICC approval a fixed percentage of service each year for several years. As regulatory restraints on competition in transportation are removed, it would appear appropriate that transportation firms become subject to the antitrust laws, from which they are now substantially exempt. In particular, it would be necessary to guard against predatory pricing, intended to establish a monopoly, and against monopolistic pricing, of which there are instances even under present arrangements.

Deregulation would, of course, produce profound changes extending beyond the transportation industry itself. With restrictions on competition removed, transport rates would be likely to fall; and since high-cost carriers would no longer be protected from competition the rate structure would change. Rates based on the costs of efficient carriers would tend to replace the current value-of-service rate structure. Under a cost-based rate structure, commodity distinctions would tend to disappear, and rates would be based primarily on such factors as the size and weight of shipment.

Deregulation and a shift to cost-based rates would also lead to a better use of transport resources. For many long-haul shipments, rail costs are below truck costs, while the reverse is true for short-haul shipments. Once carriers are permitted to compete and take advantage of these cost differences, some long-haul shipments would shift from trucks to the rails and some short-haul shipments would shift the other way. More generally, since traffic would flow to carriers with the lowest costs, the total resource cost of transportation would be reduced.

Many shipments that now move by rail over branch lines to main lines would instead originate by truck, transferring to the rails at the main line. To reduce the costs of such transfer, many of these multimodal freight shipments would be sealed in containers which could be interchanged among

modes. In this way, both those shippers located close to the main line and those farther away could take advantage of the flexibility and short-haul cost advantage of trucks as well as the long-haul cost advantage of rails. At the same time, much of the cost to the rails of maintaining excess track and underutilized equipment on these lines would be removed.

Many shippers in small towns oppose railroad abandonments of branch lines today, because they fear that under present regulation lower-cost truck service would not be substituted. However, if carriers were free to compete on rates as well as to enter and leave markets as they saw fit, the abandonment of high-cost rail branch lines would create a new market for trucks. Competition among trucks would frequently result in lower freight rates for branch-line shippers than they now face. Such shippers would also greatly benefit by the savings from the multimodal long-haul shipments that increased competition in transportation would stimulate. Regulation is sometimes justified as protecting shippers in nonmetropolitan areas from loss of service. It is argued that without the service requirements imposed by regulation not only railroads but trucks as well would abandon nonmetropolitan areas for the more populous markets. It appears, on the contrary, that regulation prevents many nonmetropolitan shippers from realizing the benefits of competition.

Evidence that nonmetropolitan shippers can and do benefit from a competitively organized transportation industry is provided by experience in agriculture. In response to farm pressures, truckers of agricultural products were exempted from the 1935 extension of ICC regulation to trucking. In the 1950's fresh-dressed and frozen poultry and frozen fruits and vegetables were added to the list of exempt agricultural commodities. The Department of Agriculture found that this resulted in rate decreases averaging about 30 percent for poultry and 20 percent for frozen fruits and vegetables. At the same time shippers reported that the quality of service offered by the nonregulated truckers was generally superior to that previously offered by the regulated truckers. This experience indicates that residents in nonmetropolitan areas may receive substantial benefits from a fully competitive transportation industry. In addition, with cost-based competitive rates, some of the manufacturing activity now carried on in the large population centers, because of the high finished-goods rates in the current value-of-service rate structure, would then shift to smaller towns and generate increased incomes there.

In evaluating the distribution of the gains from competition in transportation the broad national gains should not be overlooked. Residents of all areas are affected by transport rates both as producers and consumers, so that the lower transportation rates brought about by increased competition would benefit residents in all parts of the Nation. This, in the final analysis, is why a deregulated transportation industry would better serve the public interest.

Indeed, recent developments in the railroad industry suggest that deregulation of transportation may have to be considered as a matter of urgent

national priority. Several railroads, including the Nation's largest, are in reorganization; and the Congress has approved Federal Government guarantees for \$125 million in loans to these railroads. These significant developments, however, are only symptoms of more far-reaching problems that appear to be incapable of permanent solution without regulatory reform. The over-investment and misallocation of capital in railroad facilities, and the regulatory restriction on the ability of railroads to set rates that would capture profitable long-haul traffic where they are most efficient, have led to a steady decline in the railroads' own rate of return on investment from an average of 3.7 percent in 1950-59 to 2.8 percent in 1960-69. As the financial condition of the railroads has deteriorated, investment of funds in the railroad business has also become more risky. Today the average rate of return on the railroads' investment, with its increased risk, is less than half that on risk-free Government bonds.

In the absence of regulatory reform it may not be possible for the railroad industry to attract sufficient private capital to prevent further deterioration of service in the years ahead. The Federal Government would then become increasingly involved in the preservation of freight service, as has already happened in passenger service.

#### **RAIL PASSENGER SERVICE**

Rail passenger traffic has declined steadily in recent years, and now accounts for only 8 percent of intercity passenger movements by public carriers. Railroads have long been seeking to abandon unprofitable trains, but this was difficult under existing rules. The Railroad Passenger Act of 1970 permits a railroad to discontinue all its intercity passenger service on May 1, 1971, provided that it invests in the newly-created National Rail Passenger Corporation. Most of the capital for the Corporation will come initially from a Federal Government subsidy and guaranteed loans, and a majority of its Board of Directors is to be appointed by the President. The Corporation must raise any additional capital without Federal assistance. It will at the outset eliminate many of the passenger trains which are now unprofitable, and operate an integrated system of passenger trains serving all regions of the country that, it is hoped, will ultimately be profitable.

#### **AIR TRANSPORTATION**

Like surface transportation, the air transportation industry is subject to Government regulation which has restricted price competition and appears to have created some inefficiency. This regulation was instituted at the request of the carriers in 1938. Entry into the industry or into a particular market almost always requires a certificate from the Civil Aeronautics Board (CAB), and carriers may not charge rates below those approved by that agency.

This regulation has probably resulted in rates that in many cases are higher than they would otherwise be. In the segments of the industry where

entry has sometimes been permitted—namely, nonscheduled, commuter, and air taxi service—new firms have entered quickly. Some indication of the degree to which regulation has raised rates is provided by the air transportation experience in California. Airlines operating wholly within a State are exempt from CAB regulation. Until recently, California permitted free entry into intrastate markets and did not regulate rates. Competition from intrastate airlines has resulted in fare levels per-mile within California that are approximately 40 percent below those for comparable services in the rest of the Nation. As a result, air traffic between Los Angeles and San Francisco far exceeds that between any other two cities in the world.

Nonscheduled carriers provide further evidence of the benefits of competition. In the late 1940's, a few carriers were permitted to enter the market in order to provide unscheduled service as a supplement to scheduled service. The nonscheduled entrants took an increasing share of the market by undercutting the rates of established carriers in longer-distance markets where rates most exceeded costs. The scheduled carriers responded by promoting low-cost coach service. The regulatory authorities also took action to curb nonscheduled lines. While the public is thus denied the benefits of extensive domestic nonscheduled competition today, the rapid growth of coach service is, in part, an important legacy of the earlier competition.

In 1970, many airlines experienced excess capacity and low profits. This partly reflected the absence of normal traffic growth. From 1960 to 1969, domestic air passenger miles increased at the rate of 12 percent per year. In 1970 there was virtually no growth, while many airlines were taking on another generation of aircraft. In that sense the problems of the airlines are similar to those a decade earlier when they were shifting to jets, while traffic growth decreased and for a time reported earnings were also down sharply.

There is also, however, a more fundamental problem. As is true in surface transportation, the substitution of service competition for rate competition tends to result in excess capacity. Fares higher than a more openly competitive market would establish have not, therefore, led to correspondingly high rates of return. Through the inducement to excess capacity, overinvestment in facilities and planes occurred. Costs were thereby increased, and the financial performance of the companies, even with sheltered fares, has recently been unsatisfactory. Faced with some excess capacity, airlines have asked the CAB to approve intercarrier agreements to reduce flight frequencies in selected markets. Such a remedy tends to treat the symptoms of the problem without removing the cause. The original cause of the excess capacity was regulatory restriction of price competition. If price competition had not been inhibited, the incentive for airlines to provide excess capacity would have been reduced.

The resumption of a more vigorously expanding economy will ameliorate part of this problem by increasing air traffic. It must be remembered, however, that these problems will be recurrent if prices are held substantially above what they would be in a more openly competitive market. Para-

doxically, the earnings performance of the airlines themselves is apt to be adversely affected if this basic principle is persistently ignored.

## NATURAL RESOURCES

The utilization of natural resources normally proceeds from lower-cost to higher-cost sources. As the best sources are depleted, new supplies can be obtained only by exploiting those that involve lower grades and higher costs. Copper is an example. The average ton of copper ore mined in the United States in 1911 contained 1.82 percent copper. By the late 1960's the copper content of ore had dropped to six-tenths of 1 percent, and some new mines now produce ore with less than five-tenths of 1 percent of copper. Technological improvements have counteracted this tendency toward higher costs of production. The number of man-hours of direct labor required to produce a ton of copper ore has declined from 4 hours in the 1920's to one-quarter of an hour in the 1960's. The net effect of these tendencies is that the price of copper in peacetime has moved from a range of 10 to 20 cents in the earlier part of this century to between 30 and 60 cents per pound in recent years, or roughly in line with the general price level.

Not all natural resources have increased in price over the years. Aluminum prices, after bottoming out in the 1940's, are now at about the same level as in the 1920's. As a result of these relative price changes aluminum has replaced copper in many applications. In spite of technological advance and substitution there nevertheless remains a concern about the ability of this Nation to continue producing a high proportion of the industrial raw materials it consumes. Accordingly, Congress has established a National Commission on Materials Policy to estimate the supply-demand situation that will be confronting us toward the end of this century and to recommend appropriate policies.

## ENERGY

Sharp price increases in two major energy products, combined with concern about the extent of their supply, have focused particular attention on the Nation's energy resources. In late 1970 the price of heavy fuel oil, which is used by electric utilities, industrial plants, and other large institutions, was almost twice as high as a year before in some markets. Bituminous coal, used primarily by electric utilities, was also priced substantially higher in the spot market than a year before. Natural gas supplies were not available to meet desired consumption at prevailing prices, and therefore the demand for substitute fuels increased. Nevertheless these recent price increases and shortages are not symptoms of a growing scarcity of energy resources. They are the result of unanticipated developments that the energy industry has been unable to offset completely in a short time-span, in particular a stronger demand for energy than was expected from past experience. Programs to reduce air pollution by prohibiting high-sulphur fuels contributed to the problem.

Coinciding with the acceleration of demand, there have been several disappointments on the supply side. The generation of electric power, particularly in atomic plants, has not met the expectations of electric utilities because of construction delays, licensing problems, and environmental concerns. In part, these difficulties reflect the assumption a few years ago that atomic power would become profitable, an assumption that slowed coal mine development. Heavy fuel oil supplies have been limited by a world tanker capacity that has not yet adjusted to the longer delivery runs required from the Mideast after the Trans-Arabia Pipeline was severed. This limitation on supply has resulted in higher prices for heavy fuel oil. Since heavy fuel oil can be imported to the east coast without quotas, that area has come to rely on these normally lower-priced foreign sources for a large share of its supply, and domestic refiners have had no incentive to construct refineries with much capacity for these heavy products.

These short-run problems are being resolved by Federal action and by adjustments in the market. Higher domestic prices of heavy fuel oil have attracted more supplies from abroad; these higher prices have also induced domestic refiners to increase their yields of heavy fuel oil. Actions by the Interstate Commerce Commission to increase the efficiency of utilization of hopper cars, including a doubling of the demurrage charge, have helped to correct another bottleneck by adding about 3 percent to the hopper car fleet's delivery capability. As a result, the previously low level of coal stocks at electric utilities has been raised to the normal range, and spot coal prices have turned downward.

In anticipation of local supply problems in the winter of 1971 a Joint Board on Fuel Supply and Fuel Transport, chaired by the Director of the Office of Emergency Preparedness, was created last September. Actions by this Board and its New England field board have resulted in increased supplies in that area. The field board, in cooperation with local and State authorities and industry, has resolved more than 50 complaints in the area. Barring extraordinary events—such as a rail strike, or extremely severe weather in the remaining winter months, or disturbances of international oil supplies—fuel consumption in the United States should not be significantly curtailed in the winter of 1971.

With tankers being built as rapidly as world shipyard capacity permits and with improvement in the efficiency of our rail system, the transportation problem should begin to abate. Although transportation bottlenecks can arise from time to time, the principal long-run energy problem in the future is to increase the amount of energy produced while avoiding a substantial increase in its price.

Domestic energy consumption between now and the year 2000 is likely to exceed all of the energy consumed by this Nation in its history. This enormous future demand raises questions about the supply of energy fuels, their price, and the role that different sources of energy will play.

Once current technical and environmental problems are resolved, nuclear energy promises to contribute significantly to the electric power supply. While oil and natural gas supplies from conventional sources in the United States appear to be small relative to current consumption, this is not true of coal. However, technology that will inexpensively reduce the air pollution now produced by coal burning may have to be developed if the cost of using coal is not to increase. Coal can also be liquefied and refined to substitute directly for gasoline or fuel oil. It can also be gasified to substitute for natural gas. Liquefaction and gasification of coal are both approaching the margin of economic feasibility. The production of oil from oil shale is another marginal economic proposition, and it is expected that with production experience costs will be reduced further. In the States of Colorado, Utah, and Wyoming there are enormous reserves of oil shale. These sources of energy are not now being exploited because there are less costly ways to supply energy, another illustration of the principle that least-cost resources will be used before those that are more costly.

Even the potential supply of some traditional sources of energy has increased since World War II. An enormous production potential in the Middle East has been hanging over the world petroleum market, production costs there being less than one-tenth the selling price for typical Middle Eastern crudes. Close cooperation among foreign producing countries has thus far enabled them to prevent world prices from falling sharply. Attempts at price increases will, of course, be made, but discoveries of new sources throughout the world will tend to exert countervailing pressure. The increasing number of supertankers should reduce transportation costs, and thereby help to keep delivered prices down.

Within the United States there has been persistent overcapacity in crude oil production. Excess capacity in Texas and Louisiana has typically been over 30 percent in the last decade and has at times exceeded 40 percent of total production capacity. The State prorationing agencies have held back domestic production, and this, together with strict national security limitations on imports, has maintained relatively high U.S. oil prices.

It is important to distinguish between two main functions of State agencies that regulate crude oil production. The first function arises because crude oil is mobile underground and will flow to where it is being drained. If a pool of oil is not produced as one unit, owners of individual portions of the pool have an incentive to lift oil to the surface in their segment rapidly; whatever oil they do not remove themselves will be left for others or may become irrecoverable. Since excessively high rates of production tend to result in lower ultimate recovery, competitive production from a single pool will often be wasteful. By prorating production to individual producers in a pool, State prorationing agencies can enforce the same rate of production that would occur if the pool were being operated economically by a single operator. This is the conservation function of State prorationing agencies.

In some cases, however, these efforts go beyond conservation and limit total production to the market demand for crude oil in the State at prevailing prices. Since the quantity of oil demanded is related to its price, limiting production to the quantity demanded at a particular price tends to support that price. This market demand prorationing, as opposed to conservation prorationing, has often kept production in the United States below efficient capacity. On the other hand, the idle capacity has given us a standby supply of oil that has sometimes been useful in times of international stress.

In the second half of 1970 domestic production was close to capacity. One reason is that imports changed little, and another is that production capacity itself has not grown as rapidly as domestic demand. In part, capacity may have shown little growth because of the negative incentive effects of market demand prorationing. The value of an oil discovery depends not only on the price of oil but also on the rate at which production is permitted. If production is restricted to low levels, the potential value of a new oilfield is reduced. The effect of market demand prorationing on the development of new capacity is therefore similar to that of a lower price.

The action announced by the President in December 1970 to remove market demand restrictions on Federal offshore leases not only promises increased production from existing offshore wells but will also encourage exploration for and development of new productive capacity on Federal offshore land. Supporting this view is the fact that bonus bids received by the Federal Government on the December 15, 1970, Gulf of Mexico sale of leases exceeded earlier expectations and resulted in more revenue than any previous Federal sale.

There appears to be a shortage of one major energy fuel, natural gas; that is, its production is clearly falling short of desired consumption at current prices. Current prices for interstate sales have been kept low by the Federal Power Commission, which sets these prices under law. Not only have prices been too low for desired consumption to be met, but they appear also to have retarded development of new gas supplies. The only satisfactory solution of this problem is to allow the price, at least of new gas not previously committed, to approach the market-clearing level.

It is important to recognize that increased gas supplies, even at higher prices, would offer direct benefits to the consumer. Some users would switch to natural gas if it were available because the price of gas in terms of heating value, though higher than before, would still be lower than the price of the fuel they had been using. Industrial users would switch because gas contains little sulphur and would be the cheapest way for them to meet air quality standards. The added competition of these new supplies would also tend to reduce prices for consumers of other fuels. If the price of natural gas on old commitments remained under control, consumers would be protected from unnecessary price increases on current supplies.

## TIMBER RESOURCES

Timber is another natural resource whose supply is affected by Government policies. In fact, there are few areas where Government has as much direct control over the supply of natural resources as it has in timber. About 65 percent of the more than 2 trillion board feet of our Nation's inventory of softwood sawtimber is on public lands. More than half of the total is on land owned by the Federal Government. These softwoods, principally evergreens, provide the major wood materials used by the building industry, and as the economy has grown so also has the demand for softwood.

With only 16 percent of the inventory, the private forest industry has accounted for almost a third of the softwood sawtimber harvests. Public lands have provided some 40 percent, the remainder coming from the private holdings of farmers and other small private landowners. In times of increased demand it is to these private holdings that the forest industry has commonly turned to augment supply. As a result of past cuttings, however, this source of supply has been reduced, and time will be required to regrow much of the timber on private lands.

This decline in supply occurs at the same time that the Nation's demand for softwood lumber products is expected to grow substantially. If the Nation's housing demand for this decade is to be met, the annual consumption of softwood lumber and plywood by the housing industry may have to increase by as much as 75 percent over current levels. And as the economy resumes a course of vigorous expansion, nonhousing demand for softwood will increase as well. It has been estimated that for the economy as a whole the annual demand for softwood sawtimber, assuming that prices remain at their 1962-67 levels, could reach 70 billion board feet by 1978, some 40 percent above the level of consumption in 1969. Accordingly, the President has directed the Secretary of Agriculture to formulate plans for increasing timber yields on Federal lands.

An increase in the timber harvest through intensified management promises broad public benefits. Not only will consumers of wood products, particularly purchasers of housing, benefit through lower prices, but this can be achieved while keeping our timber resources intact. Unlike other natural resources, forests are renewable, so increased cuttings need not imply a permanent reduction in the annual lumber supply. Indeed, it appears that, with proper planning and management, the permanent yield of forest lands can be increased.

Growing concern for our environment necessitates that increases in timber supply be achieved in a manner which is consistent with the preservation of natural surroundings. In the past, cutting has frequently been synonymous with denuding the land, but this is by no means inevitable. By partial cutting and careful selection the negative aesthetic and environmental impact of harvesting can often be kept to a minimum. Indeed, increased harvests can offer benefits beyond the increased supply of timber, for intensified forest management can also result in a natural increase in wildlife and improved opportunities for recreation.

## HEALTH CARE

Expenditures for health care have grown rapidly as families' incomes have increased and as Government has assumed greater responsibility for the medical bills of the aged and many of the poor. Total private and public health expenditures grew from \$42.3 billion in fiscal year 1966, the year before the introduction of Medicare and Medicaid, to \$67.2 billion in 1970, or at a rate of 12 percent per year. (Health expenditures are defined more broadly here than in Chapter 3.) Hospital and nursing home expenditures have grown most rapidly, with expenditures for physicians' services and other types of expenditures rising somewhat more slowly.

Price increases account for a considerable portion of the change in expenditures. The medical care component of the consumer price index increased at an annual rate of 6.4 percent between fiscal years 1966 and 1970. The price of daily service charges in hospitals rose at the rate of 14.4 percent per year, while physicians' fees rose at a 6.7-percent rate. Yet in 1966 prices, expenditures for health still grew by 24 percent during these years, rising to 6.4 percent of real GNP in 1970 from 5.9 percent in 1966.

### THE SUPPLY OF MEDICAL SERVICES

Between 1966 and 1970 the number of active physicians grew at more than twice the rate of the total population; from 151 active physicians per 100,000 people the figure rose to 159. This growth has been accompanied by a decline in the proportion of physicians who provide primary patient care (general practitioners, pediatricians, and internists) and an increase in the proportion who enter the other specialties. Despite some debate over whether the total increase in services has been sufficient to meet the recent increase in demand, there is agreement that the uneven geographic distribution of physicians presents problems for sparsely populated and inner city areas. There is also growing interest in the possibility of improving the organization and delivery of health services to provide more services for people throughout the country. If more doctors were to practice in groups, where they could take advantages of timesaving equipment and allied health personnel, their productivity could be increased. Group practice might be more suitable than solo practice in some of those areas where health services are difficult to obtain.

Between 1966 and 1969, beds in short-term non-Federal hospitals, where most of the acute hospital care is provided, increased by 7.6 percent. Patients' days in the hospital rose somewhat more, by 10.7 percent between 1966 and 1969, and annual patient-days per person in the country rose from 1.095 to 1.178. This rise in patient-days was due primarily to the increased rate of hospital admission of the aged following Medicare and to their longer average stay after entering a hospital. Hospital use among people under age 65 increased only slightly.

## INCREASES OF MEDICAL CARE PRICES

The rapid increase in medical care prices cannot be completely explained by the lack of rapid growth in the supply of the services of physicians and hospitals. The recent increase in fees may be partly a result of the fact that many patients no longer have to pay their own medical bills. The itemized billing required by public and private insurance has also encouraged charging for services which were previously including in a package.

The increased price of hospitalization reflects an increase in the cost of their operation more than a shortage of hospitals. As the financial position of the hospitals has improved following Medicare, they have been more willing to consent to doctors' requests for better equipment and expanded facilities and to pay their employees higher wages. Because Government and most private insurers pay the hospitals according to their costs, these increases are rapidly passed on to the consumer directly or through Government.

## WHO PAYS THE BILLS

While the organization and delivery of health care services has been changing relatively slowly, the method of paying for personal health care has altered dramatically. Private health insurance has grown rapidly in the past two decades and now pays 24 percent of all medical bills as compared to 8 percent in fiscal 1950. Government has expanded its financing of medical care from a responsibility for the Armed Forces, veterans, municipal hospitals, and various public health services to the assumption of a large share of medical bills of the aged and poor. The fraction of medical care expenditures paid by Government has increased from 20 percent in 1950 to 35 percent in fiscal 1970. The consumers of medical services are as a consequence directly paying a decreasing portion of medical care costs. Of the \$280 of personal health care services provided per person in fiscal year 1970, individuals paid out of pocket an average of \$110, or less than 40 percent.

The out-of-pocket share of medical expenses which a family must pay depends greatly on the age of the family members. In fiscal year 1969, Medicare, Medicaid, and other Government programs paid about 72 percent of the medical care expenditures of the aged and, after some smaller contributions from private sources, left them with out-of-pocket expenses averaging \$163 per person. In contrast, the Government paid only about 23 percent of the expenses of persons under age 65. Private insurance paid about 29 percent, and the individual paid 46 percent of the total or an average of \$98. These out-of-pocket expenses are less than those made by the aged, even though the aged pay a lower fraction of their medical bills.

Among persons under age 65, out-of-pocket expenses vary considerably depending upon the type and level of expenditures and upon the income of the family. In 1969 about 81 percent of individuals under age 65 had some form of hospitalization insurance and 79 percent had surgical insurance. Physicians' office visits and many services which prevent serious illness were much less likely to be covered, thereby encouraging resort to hospitalization

even though it tends to involve higher costs. Insurance paid about 70 percent of consumer expenditures for hospital care, about 45 percent of consumer expenditures for physicians' fees, and considerably less of other types of services. Private insurance covers an increasing fraction of a person's expenses as these rise up to some level, but a declining fraction as expenses become very large.

Middle and upper income families are much more likely to be covered by private insurance than are low income families. In 1968, for example, over 90 percent of the persons under age 65 in families with incomes of \$7,000 or more had some type of hospital insurance, while only 36 percent of people in families with incomes below \$3,000 had coverage. Of these low income people, those aged 56-64 were twice as likely to be covered as were children under age 17. The Medicaid program, which pays the medical bills of welfare recipients and certain low income people with high medical expenses, is putting an increasing burden on many States but is often inadequate to meet the needs of the people it is designed to serve. The program also reduces the incentive of poor persons to earn more income by making them ineligible for benefits if their income rises above a certain level.

There have been three broad problems in the Nation's health programs. The distribution of health services is uneven by income groups and geographic areas. There has been an imbalance between programs which increase the demand for these services and programs which augment the supply of trained personnel and improve the organization and delivery of health care services. Finally, there has been the problem of assuring an efficient utilization of the resources devoted to health care. While the increase in real expenditures on health has benefited large groups of the population, further efforts are needed to resolve these remaining problems.