

6-1-1971

Environmental Pollution, Externalities, and Conventional Economic Wisdom: A Critique

R. C. d' Arge

E. K. Hunt

Follow this and additional works at: <http://lawdigitalcommons.bc.edu/ealr>

 Part of the [Environmental Law Commons](#), and the [Law and Economics Commons](#)

Recommended Citation

R. C. d' Arge and E. K. Hunt, *Environmental Pollution, Externalities, and Conventional Economic Wisdom: A Critique*, 1 B.C. Env'tl. Aff. L. Rev. 266 (1971), <http://lawdigitalcommons.bc.edu/ealr/vol1/iss2/3>

This Article is brought to you for free and open access by the Law Journals at Digital Commons @ Boston College Law School. It has been accepted for inclusion in Boston College Environmental Affairs Law Review by an authorized administrator of Digital Commons @ Boston College Law School. For more information, please contact nick.szydowski@bc.edu.

ENVIRONMENTAL POLLUTION, EXTERNALITIES, AND CONVENTIONAL ECONOMIC WISDOM: A CRITIQUE

By R. C. d'Arge❖ and E. K. Hunt❖❖

In the technical jargon of economics the word "externalities" is used to refer to the ways in which acts of production, market transactions, or consuming affect people who are not directly involved in those acts. For example, the purchase of and operation of an automobile by one individual affects other individuals in increasing the likelihood of the other individual's: having an accident; being caught in heavy traffic; or suffering from vehicle exhaust gases; increased noise, higher taxes for highway construction, and ultimately from despoilation of the landscape by vehicle carcasses. The individual in purchasing the vehicle generally does not consider these environmental effects on his fellow men. Conventional wisdom in economics maintains that the individual does not pay for such disamenities and therefore is unaware of them; or, if aware, self-interest precludes individual action. If he were made to pay, so goes the conventional wisdom, then the market for the purchasing of automobiles would become efficient in the allocation of resources.

In everyday parlance, the word "externalities," more often than not, refers to pollution of all kinds. Externalities stemming from pollution traditionally have not received much attention from economists. They have been treated as exceptional and, by implication, unimportant problems which can easily be resolved. Perhaps such complacency was warranted when economies were largely agrarian with no population concentrations, and the extent of externalities was the infrequent antagonism of displaced indian tribes. Such an economy is long past, but the treatment of externalities in economics, even in many recent theoretical analy-

ses, borders on the notion that externalities are "freakish anomalies easily adjusted for within an otherwise perfectly functioning competitive system."

In this paper, we endeavor to demonstrate that the *entire* normative framework within which most economists have treated externalities in the past is at least partially defective. Its defects in many instances are so devastatingly complete that we do not believe progress can be made in understanding and resolving the social and economic problem of environmental pollution and degradation unless economics radically reorients its entire frame of reference. Our purpose here is to point out the necessity of a change in economic viewpoint, and attempt to sketch a very crude road map toward reorientation.

A BRIEF SKETCH OF ORTHODOXY

The conventional intellectual tradition in economic theory, covering at least the last two hundred years, rests squarely upon hedonistic preconceptions. It contains both a psychological hedonism and an ethical hedonism. The psychological hedonism was, in the late nineteenth century, a rather crude theory of human behavior. Men were pictured as being concerned primarily, if not wholly, with maximizing individually derived utility or minimizing disutility, both conceived in strictly hedonistic terms. In more recent times, the naivety of treating utility as a stable, cardinally quantifiable relationship between a man and a consumable object was ostensibly circumvented with the development of "indifference" analysis.¹ But indifference analysis only substituted ordinal quantifiability for cardinal quantifiability—hardly a drastic modification.

Finally, nearly a century after hedonistic psychology had been thoroughly discredited, economists announced that they were abandoning psychological premises and using only behavioral axioms that were intuitively obvious.² The "substitute" for the older view was to assume that all individuals, regardless of the nature of their motives, preferred some things to other things. If these self-centered preferences were reasonably stable, economists needed only posit a preference ordering that could take the place of the utility relationship. Preference orderings were, of course, just another name for the hedonistic preconceptions which most economists brought with them to their analyses.³

The ethical hedonism in orthodox economics has been called

“the pig principle” by Professor S. S. Alexander. The pig principle is simply “that if you like something, more is better.”⁴ Thus, the ultimate normative principle of Benthamite Economics was that more pleasure is better than less and the level of my pleasure is unrelated to yours; for late 19th century neoclassical economists it was that more utility is always ethically better than less utility; the modern version is that a preferred position on one’s individual preference ordering is ethically better than a less preferred position.

These different forms of economic hedonism have only one consequential difference. In Bentham’s hands the notion of diminishing marginal utility had uncomfortably radical egalitarian implications, namely an equal distribution of income. But, according to Joan Robinson, “the method by which the egalitarian element in the doctrine was sterilized was mainly by slipping from utility to physical output as the object to be maximized.”⁵

Modern micro-economic welfare theory begins by describing an economic system in which: (1) market choices by consumers are determined by a coherent subjective preference ordering; (2) the decisions concerning what commodity mix to produce and how to produce it are governed solely by the desire of producers to maximize profits; (3) buyers and sellers are pitted against each other in a market which is so large that no individual buyer or seller can, through his own purchases or sales, affect the market price; and (4) however much one consumer consumes he is unaffected by what others have to consume, or breathe. This last assumption could very well be called the second “pig principle”.

From certain axioms about the nature of consumer preference orderings and the technical relationships between inputs and outputs, a consistent line of deductive reasoning leads to the conclusion that an economic system of this description will allocate its resources in such a way that any possible change in production, distribution or consumption that could possibly make one person better off (leave him in a preferred position) could only be brought about by making someone else worse off (leave him in a less preferred position). In short, resources would be efficiently allocated so that, given existing tastes, the supposition of individual oriented desires, and the existing income distribution, it would be impossible to augment the aggregate value of production through a reallocation.

It is then argued that scientific objectivity prohibits the econo-

mist from making a normative choice between two situations which involve the bettering of one person or class of persons at the expense of another person or class of persons. Hence the conclusion is reached that the criterion of "economic efficiency" is scientific, whereas the criterion of "equity" or the distribution of income is not. The competitive capitalist economy is shown most perfectly to satisfy the criterion of "economic efficiency."⁶ Therefore, no other system can, on "objective and scientific" grounds alone, be shown to represent an improvement over this capitalist price-market system. By extension, this doctrine becomes a claim that laissez-faire capitalism at least represents one of the best of all possible worlds.

The criterion of economic efficiency is a part of what economists call the norm of Paretian optimality (named for the Italian Economist Vilfredo Pareto). This norm of optimality can be defended only on the assumption that the structure of relative prices embodies the ultimate moral principle upon which moral judgments are based. It was in recognition of this fact that the Austrian school of neoclassical economists laid so much emphasis on the notion of a "rational price structure." For them the statement that the capitalist market system created a rational price structure was tantamount to giving the pig principle its place as the foundation of all social and moral judgments. The rationality of the price system supposedly derived from its reflection of the relative strengths of the desires of the persons within the social system (ignoring the income distribution problem).

There are, however, many potential flaws in the system which make the achievement of Paretian optimality improbable, if not impossible. The principle's admitted weaknesses are: (1) Some buyers and sellers *are* large enough to control prices and, moreover, the economies of large-scale production seem to render this inevitable. (2) Some commodities are "consumed socially" and their production and sale would seldom be profitable in a laissez-faire capitalist economy even though they may be deemed highly desirable by most citizens within the economy (e.g., roads, schools, armies, etc.). (3) The costs to the producer of a commodity may differ significantly from the social costs of producing that commodity, so that it is possible that for society as a whole the real costs of production exceed the benefits for the commodity even though the producer may still profit from its production. (For example, a steel mill may pollute the air with sulphur oxides,

particulates, etc. but not bear the costs of the burden placed on residents downwind.) And (4) an unrestrained price-market system appears to be inherently unstable and is subject to recurring depressions that incur enormous social costs.

The principal differences separating "liberal" economists from "conservative" economists stem from an inability to agree on the extent and significance of these flaws. It is generally agreed that to the degree that the flaws do exist and do disrupt the otherwise beneficial workings of the capitalist system, they can be corrected by limited government intervention within the market system.

It is argued that government anti-trust actions can force firms to act *as if* they were competitive, and something called "workable competition" can be achieved. Roads, education, aesthetic vistas free of disruptions, and other socially consumed commodities can be provided by the government. Extensive systems of taxes and subsidies can be used to equate private and social costs where they differ due to externalities or other reasons. Finally, through the wise use of fiscal and monetary policy the government can eliminate the inherent instability of the economic system.

The flaws are thus seen as minor and ephemeral. An enlightened government can correct them and free the "invisible hand" of the market once again to create the best of all possible worlds. However, a rigorous working out of all the implications of this theory has led to a fruitless dead end. When pushed to the logical extremes inherent in it, the theory contains the seeds of its own intellectual destruction.

A CRITIQUE OF ORTHODOXY

One of the most devastating attacks came from J. De V. Graaff's tightly reasoned book, *Theoretical Welfare Economics*.⁷ Graaff demonstrated that economists had not really appreciated the long and restrictive list of assumptions necessary for the optimally efficient allocation of resources envisioned in the model of a competitive, free-market capitalism to be realized. He lists seventeen such assumptions which he has shown to be necessary.⁸ Many of them are so restrictive that one must agree with Graaff that "the measure of acceptance . . . [which this theory] has won among professional economists would be astonishing were not its pedigree so long and respectable."⁹ A few of Graaff's seventeen conditions will suffice to illustrate the flaws. The theory requires: (1) that any individual's welfare is identical with his preference

ordering, i.e., that children, dope addicts, fiends, criminals, and lunatics, as well as all other persons, always prefer that which is best for them and society should accept their desires; (2) that neither risk nor uncertainty is ever present; (3) that productivity is totally unaffected by the existing distribution of wealth; and (4) that all capital goods as well as consumer goods are infinitely divisible. These represent but four of Graaff's seventeen restrictive conditions which must obtain before the price-market system can be expected to achieve "optimal economic efficiency" in the Paretian sense.

In light of this, it is obvious that perfect competition could never be anything more than a normative model toward which government policies might attempt to move a capitalist economy. The goal could not possibly ever be achieved. But economists soon found that attempts to move toward this goal might just as likely move the economy farther from the goal.

This last point was made in an important piece of iconoclastic literature, well known to professional economists as "the theory of the second best."¹⁰ In the words of the eminent economist, William J. Baumol:

In brief, this theory [of second best] states, on the basis of a mathematical argument, that in a concrete situation characterized by *any* deviation from "perfect" optimality, partial policy measures which eliminate only some of the departures from the optimal arrangement may well result in a net decrease in social welfare.¹¹

This important argument shows that anti-trust actions, pollution taxes, or any other attempts by the government to bring about "workable competition" may result in effects diametrically opposed to those envisioned by the authors of these policies.

Further work by Buchanan and Kafoglis¹² and Baumol¹³ has shown that the rather naive faith held by many economists that a system of taxes and subsidies could nullify the adverse effects encountered when private costs differ from social costs, *i.e.*, when externalities appear, was based on an oversimplified view. Baumol showed that once again policies based on the traditional arguments sketched earlier may actually diminish rather than augment social welfare.

In addition, concerning the stability of the system, Friedman¹⁴ and Baumol¹⁵ have argued that even if it were practically possible for monetary and fiscal authorities to use their powers in the

manner prescribed in textbooks (and this is a big "if"), and if they were helped by a system of "automatic stabilizers," the problem of economic instability would probably still be insuperable.

Finally, Arrow has shown that if we adopt consumer sovereignty, *i.e.*, one man has one vote, as a fundamental normative criterion and simultaneously deny interpersonal comparisons of relative well-being (two of the basic tenets of orthodox economic hedonism), then any coherent program of government action must be imposed from above. No type of completely democratic voting under these two basic assumptions can be shown to yield an entirely consistent ordered set of alternatives with which to guide government policies.¹⁶

But as devastating as these logical attacks on economic orthodoxy have been, the theory is even more vulnerable on psychological and ethical grounds. One of the most fundamental weaknesses, from a normative standpoint, is that the desires which give the price system its supposed rationality are themselves treated as ultimate, metaphysically immutable givens, each on an equal footing with the other. The underlying theory of action for the possessors of these desires was most aptly described by Veblen:

[This] conception of man is that of a lightening calculator of pleasures and pains, who oscillates like a homogeneous globule of desire of [individual] happiness under the impulse of stimuli that shift him about the area, but leave him intact. He has neither antecedent nor consequent. He is an isolated definitive human datum, in stable equilibrium except for the buffets of the impinging forces that displace him in one direction or another. Self-imposed in elemental space, he spins symmetrically about his own spiritual axis until the parallelogram of forces bears down upon him, whereupon he follows the line of the resultant. When the force of the impact is spent, he comes to rest, a self-contained globule of desire as before.¹⁷

Thus the neoclassical theory upon which the criterion of efficiency is based completely ignores the social institutions which to a large extent determine the types of wants and desires the individuals in a given social system will have, and the ways in which they will attempt to satisfy these desires. The individual desires are simply taken as the metaphysically given best criteria of goodness and badness.

Economists have usually been somewhat uncomfortable with

this patently untenable version of human nature as can be seen in Adam Smith's treatment of "moral sentiments," Ricardo's "habits and customs of the people," and Marshall's "wants adjusted to activities." However, when it comes to a defense of the rationality of the market price structure and the normative criterion of market efficiency these sociological afterthoughts have absolutely no place.

Market efficiency, despite its superficial plausibility as an impartial normative criterion, shows itself on examination to be virtually worthless. In the words of Joan Robinson, ". . . drug fiends should be cured: children should go to school. How do we decide which preferences should be respected and which restrained unless we judge the preferences themselves."¹⁸ Indeed, one of the central problems with which moral philosophers traditionally have been concerned is how to control these preferences and the desires which are morally repugnant. A philosophy which elevates all desires to the same plane and then makes these desires the ultimate criteria of goodness and badness would have been ridiculed by any of the important ethical philosophers.

If, as many social scientists believe, the market and its many attendant economic, social and political institutions influence the entire fabric of our society, then the traditional handling of externalities in economics is completely inadequate. If the social process creates desires in the majority of the participants in that process which when subjected to some normative criteria are morally repugnant, it makes absolutely no sense to ask our participants if they would prefer having different preference patterns and how much they would be willing to pay for these new preference patterns. In the words of S. S. Alexander:

The pig will not want to pay anything to be made into a Socrates.

That wants are generated by the social process . . . in the profound sense of the dependence on the whole cultural matrix certainly threatens the entire ethical basis of [traditional] economics, striking in particular at Pareto optimality. *It challenges the principle that more is better and opens up the question of what sort of wants we should generate, what sort of men we should make.*¹⁹

It is obvious that the criterion of market efficiency involves a sort of egocentric myopia of which one should be wary in any serious discussion of normative economics. Such a discussion requires not only an explicit, normative model of the Good Society

and the Good Man but also entails the necessity of attempting an evaluation of any and all important social and cultural institutions and their relationships to the whole social system. Taking wants generated by the system as the ultimate normative criteria of the system itself appears to be indefensible.

And yet it is within this normative context that most discussions of economic externalities take place. The usual approach has been to assume that when the production process creates costs the producer would not normally bear in a market economy, he should be taxed an amount equal to the difference between his private costs of production and the total social costs of production. The tax should then be given as a subsidy to those who are unwillingly forced to bear the excess costs. Presumably these costs would be limited to a relatively small number of individuals and each individual's share of the costs could be reasonably assessed.

But just how are social costs to be assessed? Here the importance of the notion of Paretian optimality is crucial. The "rationality" of the price system under conditions of Paretian optimality derives from the belief that prices, or individual values and costs, perfectly reflect social values and costs. When an externality exists it is treated as *the only* exception to Paretian optimality. It is assumed that in the particular productive process, which creates this externality, private values differ from social values, or private costs differ from social costs, or both. The process of "cost-benefit analysis" then uses a set of other prices (all assumed to be Paretian optimal) to impute the correct social values and costs in the productive process under consideration. The taxes and subsidies can then easily be applied (in theory, if not in practice), and optimality restored.

It is our contention that this orthodox method of handling externalities is completely deficient. There are two reasons, each of which is totally nihilistic as far as this theory is concerned. First, the bulk of this article, to this point, has attempted to show that the whole framework of Paretian optimality is utterly and completely vulnerable on logical, psychological and ethical grounds. If the arguments to this point are accepted the matter would be ended and the traditional treatment of externalities thrown out. But second, if one continues on pure faith alone to accept the Paretian framework, we propose to show that the treatment of externalities as "exceptions," which can be corrected with a knowledge of many other prices which *are* Paretian optimal, is

untenable on both theoretical and practical grounds. The basic reason for this is the total ubiquity of externalities.

PERVASIVE EXTERNALITIES

In the metaphysical system called a market economy *any* action of one individual or enterprise which induces pleasure or pain to any other individual or enterprise and is unpriced by a market constitutes an externality. Thus, if some guest at a formal dinner belches loudly and continuously and this belching causes discomfort to other guests, then the economy is said to be in an inefficient state. Of course, we omit consideration of cultures where such behavior is taken as indicative of the superior quality of the meal.

A more incisive example of externality is the upwind factory that emits large quantities of sulfur oxides and particulate matter inducing rising probabilities of emphysema, lung cancer, and other respiratory diseases to residents downwind. The externality arises because the factory-owners historically have not had to bear the burden of health and psychic damages which they caused.²⁰ In effect, their use of the air as a medium of waste disposal was (and in most areas still is) unrestricted and free.

These rather extreme examples underscore the difficulty of identifying which social or private actions can be identified with externalities and which cannot. Unless people in modern societies are completely homogeneous self-serving robots responding only, to price and cost, practically any deviant social behavior results in an externality. In fact, one of the reasons cited for the founding of societies is the common need for protection. Yet protection achieved by an individual through group participation is a form of reciprocal externality—I receive added protection by your presence as you receive added protection from mine. Such benefits of group participation are not priced at all or by a well defined market. We would therefore argue that externalities are a normal and inherent part of societies and not some form of isolated, deviant behavior or exceptional outcome.

The environmental pollution problem is not a problem that can be completely corrected unless modern societies revert to the consumption patterns of their agrarian past, or at least to radically different life styles. The reason is relatively simple and related to the principle of conservation of matter-energy. Whatever is produced, consumed, and discarded by the modern economy (in

terms of weight) is still here and will continue to be. Thus, the more material goods generated in an economy, the more airborne, waterborne, and solid wastes that will accumulate. Unless mankind is able to achieve 100 percent efficiency in recycling (a level of efficiency never achieved in any observed production or consumption process), the global economy will continue to generate an ever expanding amount of wastes. At current levels of gross national product in the United States, the economy is already "producing" about 6-7 points of "active" waste materials per dollar of GNP. Therefore, a trillion dollar economy tends to also produce (ignoring inflationary price rises) more than three billion tons of waste materials. Thus, on a per capita basis, this amounts to more than twelve tons for each American per year. As a basis of comparison, pigs of equal weight "produce" less than one ton of waste, in terms of mass, per year.

Another obvious aspect of modern societies is their tendency toward continued growth of population and industry in tightly woven clusters within one air basin and/or watershed. Substantial efficiencies are associated with such urbanized conurbations, especially with large labor pools, relatively low transportation costs, and economies associated with providing some urban services such as fire protection, television signals and entertainment. Yet, needless to say, such concentrations have universally yielded a rapidly deteriorating natural environment as the accumulation of waste proceeds.

To summarize briefly our arguments so far, externalities of all kinds are an inherent and important component of all modern societies. The externality arises because markets cannot instantaneously appear and disappear for each act of deviant behavior of the economy's citizenry. In other words, there would be extreme difficulties for establishing a "new" market, such as buying and selling the right to belch, each time one or more individual's actions impinged upon or aided other individuals. Externalities associated with pollution are extremely pervasive elements in modern materialistic societies because each act of material consumption or production also involves the production of wastes. Urbanization, while efficient for production and consumption, also results in the concentration of wastes and their accumulation in relatively compact areas.

THE TRADITIONAL ECONOMIC ANSWER

Beginning with Pigou, economists have advocated the appli-

cation of taxes by a governing body to correct market oriented economies for the distorting effect of externalities. More recently, some economists have advocated several alternative corrective devices including subsidies and standards or ordinances. Basically, these three methods of correction all have the same effect—to induce individuals or enterprises to be cognizant of their activities which cause externalities and thereby retard or eliminate them.

If a smoke belching factory were taxed for the amount of its downwind damages, then it would have a positive incentive to pollute less. Likewise, if the factory owners were offered a subsidy to reduce sulfur oxide or particulate emissions there would be a positive incentive for them to do so. Finally, standards or ordinances could be applied to the factory requiring a reduction in emissions.

As an alternative to these mechanisms, some economists have even suggested the creation of a market to purchase and sell the rights for emitting pollutants into water courses or the atmosphere.²¹ The rationale behind this scheme is that those downwind could then reduce emissions by buying up these rights. If it is worth less to them to have clean air than to the factory for polluting the air, the factory will be able to outbid the downwind recipients for these rights. This scheme is of course highly dependent on the efficacy of the existing distribution of income, so fortunately has heretofore evaded consideration as a viable policy alternative. In fact, there is evidence accumulating which suggests that recipients of pollution are largely the poor with little or no political or economic ability to induce a betterment of their environment.

For the economy to achieve some sort of most efficient state in the presence of externalities according to Paretian efficiency, any set of taxes, subsidies, or standards cannot be levied. For the sake of efficiency, a balance must be struck between the social damages induced by pollutant emissions and the costs to society for control. To explain the derivation of optimal control of externalities, let us take the case of automotive emissions. The conventional economic wisdom answer is that as long as the costs of imposing an *additional* control measure on automobiles (such as installation of the catalytic muffler or an absolute yearly mileage limit per vehicle) are less than the reduction of damages or social losses resulting from its imposition, it pays to impose the additional control. The criterion is nothing more than the statement

that if benefits exceed costs for adding an additional emission control regulation, tax, or device, it is worthwhile. In addition, if each control measure can be varied (for example, higher or lower emission standards or different technical specifications for "add on" devices) then a second economic criterion can be stated: at the optimum level of emission control, the change in control costs resulting from a change in the level of implementation of a control measure must be equalized with the change in damages induced by lower emissions resulting from the change in the control measure. Economists refer to these changes as "marginal control" costs and "marginal reduction" in damages respectively. In effect, this criterion specifies that the optimal level for implementation of any control measure is where marginal reduction in damages (benefits) equals control costs. If this criterion is not met (for example, applying a slightly higher fuel tax will reduce damages by more than the increase in control costs), then changing the level of control (imposing a slightly higher fuel tax) will be economically efficient. Both criteria for optimal application of control measures boil down to two rather broad generalizations: an emission control measure should be considered for inclusion into the overall group of automotive emission control policies provided (1) its benefits exceed its costs, and (2) the optimal level for any control measure is either zero if it does not meet the first criterion, or where the difference between control costs and reduction in air pollution damages resulting from the control measure is the largest.

Two additional salient points must be added, namely: what should be included or excluded in the definition of control costs and damages, and how these entities should be measured. Control costs normally would include all costs imposed on the public through administrative costs of the control program plus all losses of individuals due to the imposition of the control as, for example, the private expenditure for purchase and maintenance of smog control devices. Alternatively, damages by air pollution include all present and future social losses incurred because of the pollutants. Several damages related to the growth in automotive emission tonnages are: changes in human morbidity and mortality rates; aesthetic degradation through loss in visibility; destruction or disfiguration of the natural environment, such as the effects of oxidants on pine forests; damages to agricultural crops, livestock, and ornamental plants; and the need for greater con-

finement (or less physical activity) during peak periods of smog. Of course, this is only a partial list, but in each case the damages listed impose a loss or burden on the public which is not taken into account by the individual when he operates a motor vehicle.

By balancing control costs against damages and imputing a tax to the individual operator of the motor vehicle, the government (aided by the orthodox economists) purportedly takes into account societies' losses due to automotive emissions and in so doing the economy is returned to a Paretian efficient state. In fact, it has been rigorously demonstrated that even in the presence of pervasive externalities associated with pollution, a set of taxes on all commodities would render a non-growing economy Pareto efficient provided certain behavioral and technological conditions were fulfilled.²² The set of taxes would discriminate against commodities which caused relatively more environmental damages and encourage the purchase of those commodities with little or no societal damages associated with their production or consumption. However, in order to establish optimal taxes the State must *know* the preferences regarding environmental pollution of *all* citizens. Theoretically, this answer to the environmental problem appears satisfactory, but in our opinion, such a taxing system will not provide a complete or even a very important partial answer to the real world dilemma of environmental pollution.

The first problem is that of the explosion of numbers. For a truly efficient discriminatory tax system, the government would have to estimate literally billions of different tax rates. This is because almost every production process or act of consumption contributes a different mix of wastes to the total waste flow of the economy. When environmental pollution results from a single upwind factory, then a clearly defined tax system based on downwind damages is potentially possible. But in the case of automobiles, there are literally millions of sources, each with a different effect on society, depending among other things on the vehicle's condition, location, mode of operation, and time. The only conceptual method of discriminatory taxation in such cases is to monitor continuously the operation of each and every automobile located in urban areas. Of course, such a monitoring system is not only patently absurd in terms of cost, but there are serious questions regarding individual freedom and rights to privacy involved in such continuous monitoring.

If the literally billions of emission sources were not enough to

cast doubt on an efficient discriminatory taxation scheme, there are even more serious problems due to synergy of wastes. To illustrate the difficulty synergism induces into taxation mechanisms, assume there are two polluters. Polluter A emits oxides of nitrogen which alone causes \$20.00 in damages, while polluter B emits reactive hydrocarbons which alone causes damages at \$30.00. The combination of hydrocarbons and nitrogen oxides with sunlight will interact to create photochemical smog, which may cause an additional \$40.00 in damages. The difficult question is: Should polluter A or B pay the additional \$40.00, or both? And if both, what should be the appropriate share? Unfortunately, economics cannot provide a meaningful answer. In consequence, a pollution tax system *per se* cannot be efficiently constructed when synergism of wastes occurs, and if the natural environment has one meaningful or unifying characteristic, it most certainly is a hierarchy of synergistic processes.

A third problem with discriminatory taxation schemes, which are in any sense optimal in the Paretian sense, is the requirement that social damages be known prior to the imposition of the tax, *i.e.*, the amount of the tax depends on the amount of pollution induced societal damages. Thus, the economic system of efficient taxes (this applies to subsidies and ordinances as well) is predicated on the idea that damages must occur first. If there are no damages induced by pollutants then there is no externality. The problem of damages occurring before an externality may easily be explained away academically if the damages are small in value, but taxes after the fact offer little satisfaction to the families of patients with respiratory diseases who were prematurely killed by excessive air pollutant emissions. The major point we wish to make here is that in cases of small monetary damages such as increased cleaning bills for soot, a tax system as proposed by economists in the past might become a useful anti-pollution policy measure. For large-scale environmental pollution problems such as photochemical smog, mercury, or DDT concentrations, etc., such taxing schemes based on damages already measured are analogous to the malaria patient who decides to buy a mosquito net. The discriminatory taxing system therefore offers no solution to preventing environmental damage until *after* the damage has been incurred. Thus, such taxing systems will not work for environmental pollution which causes irreversible damages, and it is difficult to imagine any important act of pollution that once encountered is

completely reversible; *i.e.*, once the patient has emphysema, can he be completely healed such that he is identical to the human he would have been without the disease?

A fourth debilitating aspect of discriminatory taxes for resolving the pollution problem is that pollution taxes *per se* will do little to solve the basic trade-off between an expanding economy and expanding amounts of waste. Discriminatory taxes may reduce the number of high polluting automobiles relative to "clean" automobiles but will not markedly influence the growing number of total automobiles unless a much more comprehensive taxation system were implemented.

It appears as a matter of public policy that completely comprehensive discriminatory taxation systems, while theoretically sound, are not practicable. This is not to say that in certain instances discriminatory taxes cannot be used. In fact they can, but only as very crude guideposts with only a vague connection to actual or potential damages.

SOME ALTERNATIVES FOR CONTROLLING EXTERNALITIES

If it is impossible for the State to optimally correct for externalities through discriminatory taxes in complex industrial societies and it is highly questionable on normative grounds what sort of benefits would be achieved if it could, what is left? We believe that potential solutions can be found which, although not within the normal boundaries of classical economic answers, can ameliorate the effect of waste emissions.

First, we would suggest that the government view the pollution problem not as one of millions of firms and individuals each requiring adjustments, but as a problem of the society as a whole. In so doing, public policy, instead of concentrating solely on regulations at the firm or consumer level, would also be concerned with the aggregate flows of waste of the entire economy. If such a view is adopted, many of the Government's traditional tools of stabilization policy can be utilized to control environmental pollution.

For example, a fiscal policy that emphasizes maintenance of high levels of aggregate demand, immediate consumption, and employment quite innocently also accelerates rates of waste generation and accumulation. Monetary policies aimed at easing credit have the simultaneous impact of increasing immediate waste flows via a positive shift in consumption but a negative impact through encouragement of investment and thus retardation

in the flows of goods immediately "consumed" and added to the growing pile of waste. Selective instruments such as investment tax credits, depletion allowances, and capital gains provisions also have direct and indirect effects on the rate of consumption and the distribution of production between current consumption and waste and savings. Therefore, these policies also influence the potential rate of environmental deterioration. It is interesting to speculate whether the opponents of the oil depletion allowance considered the question whether such an allowance actually increased the rate of waste flows, particularly automotive emissions or carbon monoxide and oxides of nitrogen. But if Government economic policies currently have the impact of accelerating waste generation and accumulation, these same policies, if reversed, can have the opposite impact. For example, if only extremely low depreciation allowances were allowed on corporate investments, this would encourage building durability into machinery, equipment, etc., and discourage rapid obsolescence and disposal. Selective tax advantages for investment in recycling technology and direct subsidies of recycling industries could likewise reduce the flow of waste per dollar of gross national product.

A second important long-run prescriptive policy which should be given legislative consideration is the imposition of a maximum limit on family income or expenditure. By constraining expenditure of each family or individual, flow of wastes in the economy could be drastically curtailed. For example, restricting the yearly expenditure of a family of three now spending \$30,000 a year to \$20,000 per year, may reduce wastes generated directly and indirectly by the family, by as much as one-third, or 15-30 tons of wastes per year. Of course, the exact impact depends on how each family affected shifts income toward or away from relatively high pollution commodities and saving versus immediate consumption, as an income-expenditure restriction, is imposed.

While there may be some reduction in efficiency of the work force since the Horatio Alger myth would become an artifact, such a limit has some additional benefits in reducing social conflicts resulting between haves and have nots. This policy would in effect be the exact analogue of the guaranteed minimum income, but instead of placing a floor under incomes for the poverty stricken would place a ceiling on expenditure for the pollution stricken. Due to the closeness of analogy we shall dub this policy *the guaranteed annual maximum expenditure proposal*.

The reduction in efficiency of the efforts of the well-to-do, in the long-run, that would result from this imposed limitation would be partially offset by the increased incentives for the poor, since the expenditure limitation would be expected to redistribute income from the rich downward. But the net result would probably be a reduction of economic efficiency and a decline in the rate of economic growth. This, we believe, is desirable. Growth for its own sake can only be justified when an economy cannot guarantee its citizens a substantial degree of economic security and a reasonable standard of subsistence. One of the main social functions of economic growth in the United States in the past was to mitigate social conflicts caused by the inequality of the distribution of income. Economic growth permits a constantly increasing level of consumption for the poor while simultaneously keeping an almost identical relative position for the wealthy as their incomes increase. This entire process is, of course, poisoning our environment and degrading in many ways to the general quality of our lives. The spiraling process could be slowed or stopped, and economic inequality significantly mitigated by such a maximal expenditure policy.

A final and important policy prescription for environmental pollution evolves from a simple idea but is extremely hard to implement. Some readers may have questioned whether belching at social gatherings is really an externality. If accidental, it may be forgiven. If not, the individual may be socially ostracized, *i.e.*, society through repetitive conditioning attempts to teach the individual that such behavior is not acceptable, and usually succeeds. Then why not make polluting the environment an unacceptable social act? Specifically, any action by the individual which does not conserve and utilize the environment in the most limited, yet sustainable way is socially unacceptable. Owning three automobiles when two will do, or using disposable milk bottles would become the equivalent of an individual defecating on the sidewalk.

Of course, to induce such a planned shift in social behavior would be a massive undertaking. But at least a start is perceived in on-campus recycling efforts, resurgence of interest of conservation groups, and growth of anti-pollution organizations. Such activities should be explicitly subsidized by the Government to encourage environmental awareness and an encompassing conservation ethic.

Economists in the main, because of their assumption that individuals largely act only in self-interest have placed extreme limits on their proposed solutions to the environmental problem. To quote a recent Nobel Prize winning economist, Paul Samuelson:

It is in the selfish interest of each person to give false signals, to pretend to have less interest in a given collective consumption activity [clean air] than he really has.²³

Why? Because it is assumed that if he acts as a purely hedonistic individual, he will be better off. Of course, this is pure tripe since citizens actively do act in the public interest. Even the worst industrial polluters in most instances have spent some profits, though too little, on abating pollution. When Los Angeles residents were recently exposed to a gasoline called "F-310" which purportedly reduced pollution, sales of this brand of gasoline increased drastically. But economics continues to be plagued by the doctrine of self-interest. Economists have attempted to make self-interest work for society by advocating the use of pollution taxes and implicitly prescribing that self-interest in the aggregate makes for a better world. What needs to be accomplished is a persuasion of the populace away from the doctrine of self-interest and toward a doctrine of cooperation and conservation. A doctrine in which self-interest is realized but is not the dominant theme—where man is cognizant not only of his own gains but of nature's losses. Such a cooperative movement cannot occur without an extensive, government subsidized educational program. In the economist's parlance, conservation and a less extravagant existence must become a superior good—a good identified with the best or opulence.



FOOTNOTES

❖ Associate Professor of Economics, University of California, Riverside.

❖❖ Assistant Professor of Economics, University of California, Riverside.

¹ J. R. Hicks, *Value and Capital* (London: Oxford University Press, 1946), pp. 2ff.

² See, for example, L. Robbins, *The Nature and Significance of Economic Science* (London: Macmillan, 1935), pp. 83-84.

³ For a defense of this assertion see David Hamilton, *Evolutionary*

Economics (Albuquerque: University of New Mexico Press, 1970), Chapter Three.

⁴ S. S. Alexander, "Human Value and Economists' Values," in *Human Values and Economic Policy*, S. Hook, ed. (New York: New York University Press, 1967), p. 107.

⁵ Joan Robinson, *Economic Philosophy* (Garden City: Doubleday, Anchor Books, 1964), p. 56.

⁶ Although Lange and Taylor have shown that an economy in which the means of production are collectively owned and for which the same stultifying assumptions are made will also result in a state of "optimal economic efficiency." Oscar Lange and Fred M. Taylor, *On the Economic Theory of Socialism* (New York: McGraw-Hill, 1964).

⁷ J. De V. Graaff, *Theoretical Welfare Economics* (Cambridge: The Cambridge University Press, 1957).

⁸ *Ibid.*, pp. 142-154.

⁹ *Ibid.*, p. 142.

¹⁰ For the definitive formulation of their theory see R. G. Lipsey and Kelvin Lancaster, "The General Theory of the Second Best," *The Review of Economic Studies*, Vol. XXIV, 1956-57, Nos. 63, 64, and 65.

¹¹ William J. Baumol, "Informed Judgment, Rigorous Theory and Public Policy," *Southern Economic Journal*, Vol. XXXII, October 1965, p. 138.

¹² James M. Buchanan and Milton Z. Kafoglis, "A Note of Public Goods Supply," *American Economic Review*, June 1963.

¹³ William J. Baumol, "External Economies and Second-Order Optimality Conditions," *American Economic Review*, June 1964.

¹⁴ Milton Friedman, "The Effects of a Full Employment Policy on Economic Stability: A Formal Analysis," *Essays in Positive Economics* (Chicago: University of Chicago Press, 1953).

¹⁵ William J. Baumol, "Pitfalls in Counter-Cyclical Policies: Some Tools and Results," *The Review of Economics and Statistics*, February 1961.

¹⁶ Kenneth J. Arrow, *Social Choice and Individual Values* (New York: John Wiley & Sons, 1963). More recently, Edwin Haifele has demonstrated that Arrow's paradox may be nearly resolved by including intermediaries, namely elected representatives of groups and allowing vote swapping. See E. Haifele, "A Utility Theory of Representative Government," *American Economic Review*, forthcoming (1971).

¹⁷ *The Portable Veblen*, ed. Max Lerner (New York: The Viking Press, 1948), pp. 232-233.

¹⁸ Robinson, *op. cit.*, p. 50.

¹⁹ Alexander, *op. cit.*, p. 110. Italics added.

²⁰ There are, of course, a few extreme exceptions. Edward I went so far as to execute one coal burning violator, in his politically and socially

expedient but economically unsound attempt to reduce air pollutant emissions in London.

²¹ See for example, J. H. Dales, *Pollution, Property, and Prices. . .*, University of Toronto Press (1968), pp. 58–75.

²² See A. V. Kneese & R. C. d'Arge, "Pervasive External Costs and the Response of Society." in *Analysis and Evaluation of Public Expenditures: The PPB System*, Joint Economic Committee, U. S. Congress, 1st Session (1969).

²³ P. A. Samuelson, "The Pure Theory of Public Expenditure," *Review of Economics and Statistics*, Vol. 36 (November 1954).