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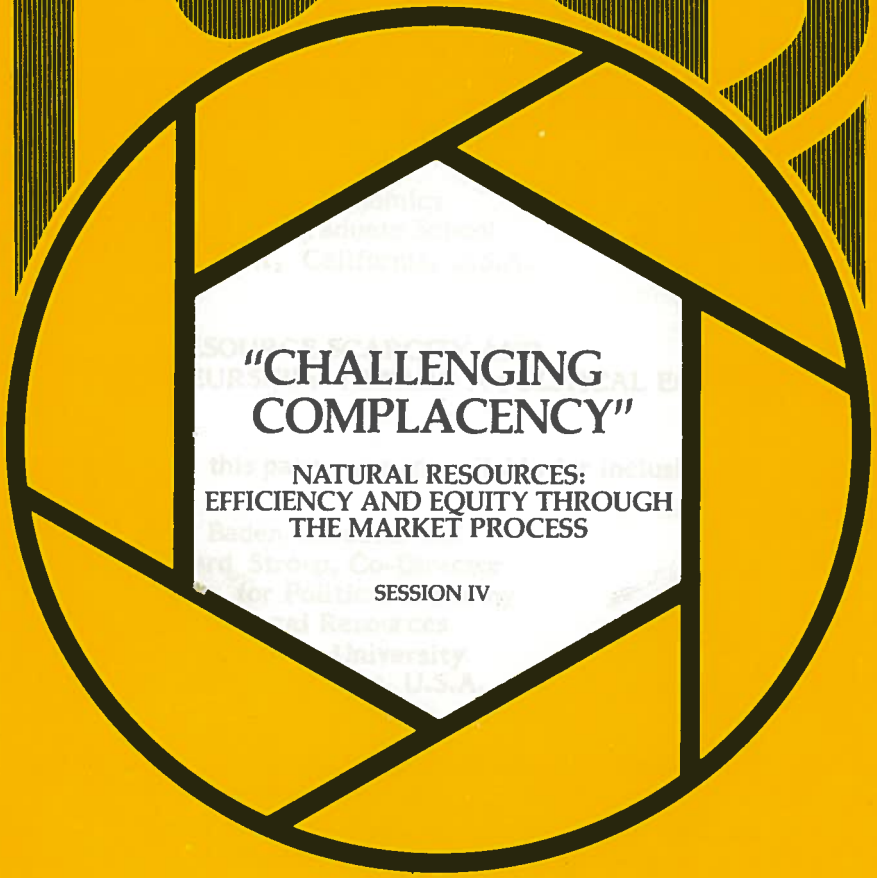

"CHALLENGING COMPLACENCY"

NATURAL RESOURCES: EFFICIENCY AND EQUITY THROUGH THE MARKET PROCESS

SESSION IV

THE FRASER INSTITUTE

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SESSION IV

NATURAL RESOURCES: EFFICIENCY AND EQUITY THROUGH THE MARKET PROCESS

NATURAL RESOURCES AND TRANSGENERATIONAL EQUITY

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...into your hands, they are delivered. - Genesis 9:2.

This we all know. The earth does not belong to man; man belongs to the earth. - Chief Seattle, speech.

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CONTENTS

I. INTRODUCTION

> Should they (parks) be a playground for today or a paradise (i.e. wilderness) to be set aside for all time. - Public Broadcasting System, television program, "National Geographic Special: Playground or Paradise."
>
> ...we will move systematically to reduce the vast (federal) holding of surplus land and property. - Ronald Reagan, **1983 Budget Message.**
>
> They pave Paradise/And put up a parking lot. - Joni Mitchell, song, "Big Yellow Taxi."

Honourable Intentions Not Sufficient

Like it or not, we are living, Irving Kristol notes, in an "entitlement society." Here, attendant social costs either are ignored or are deemed worthwhile in pursuit of that ever-mentioned good, "equity." Equity, ancient and contemporary philosophers tell us, has to do with individuals receiving what they "ought," rather than what they "will" obtain. Kristol and others, many of whom are in attendance at these meetings, have noted, however, that honourable intentions in these matters of redressing moral desserts are not sufficient. For baser egoistic motivations may direct policy and unintended and unpleasant consequences may spill over as well. In short, politics may "pollute" the social order, to use George Mason University Professor Dwight Lee's apt analogy.

The narrower theme of this paper concerns the possibilities and consequences of redistribution between the generations via the ownership and control of natural resources. This will emphasize the question of excessive cost of self-interested redistributions (feigned altruism). But it will more

sharply consider the several frustrations to collectivized charity that have, to my mind, not been noted in the social scientific literature on this subject, though they have in other contexts.

Government Ownership and Regulation

To illustrate my thinking I will draw largely upon examples from two important attempts to alter the time path of resource use by public policy. One is the issue of public ownership of U.S. federal lands. This includes the U.S. national forests, parks, recreation and wilderness areas and federal monument lands, as well as untold federally owned acres of grazing lands, watershed areas, mineral and wildlife reserves and so forth. A second policy instrument example, government regulation, is the encompassing California Coastal Act of 1976.

I chose these because of previous work of my own on the latter subject (Borcherding, 1976) and a long and wide interest in the former (directed, unintentionally, by the director, co-director and associates of the Center for Political Economy and Natural Resources in Bozeman, Montana). As well, I shall draw occasionally on evidence based on Canadian policy with respect to oil both at the level of the provincial government (the Alberta Heritage Savings Trust Fund), and inferentially, the federal government (Petro-Canada Ltd. and the Canadian National Energy Program). (See Borcherding, 1983).

The paper is organized into four remaining sections. In the next, I consider the question of allocation of natural resources and the institutional means employed to realize efficiency ends therein. In Section III some issues of intra-temporal equity are developed, i.e., distributional considerations confined to the current generation. In the fourth section the intergenerational problem is considered at some length. Finally in Section V a few comments, speculations and suggestions are made on the whole question of natural resource policy.

II. ALLOCATIVE EFFICIENCY AND THE PROPERTY RIGHT STRUCTURE OF NATURAL RESOURCES

> The love of Nature among Californians is desperately moderate. - John Muir, **My First Summer in the Sierra.**

> Contemplation of the world's disappearing supplies of minerals, forests and other exhaustible assets has led to demands for regulation of their exploitation. The feeling that these products are now too cheap for the good of future generations, that they are being selfishly exploited at too rapid a rate, and that in their excessive cheapness they are being produced and consumed wastefully has given rise to the conservation movement. -Harold Hotelling, "The Economics of Exhaustible Resources," **Journal of Political Economy.**

> We know in general that even well-functioning complete markets may fail to allocate resources properly over time. The reason, I have suggested, is because, in the nature of the case, the future brings no endowment of its own to whatever market actually exists. - Robert M. Solow, "The Economics of Resources or the Resources of Economics," **American Economic Review.**

Though the above quotation by Hotelling could have been taken from a recent publication of Friends of the Earth or the Sierra Club, it was taken from a 1931 journal edited then, as now, at the University of Chicago. It represented, as Solow's 1973 American Economic Association's Ely Lecture does today, the intellectual mainstream view on natural resources. This takes as given that private ownership forms fail to allocate resources optimally over time. Furthermore, both statements imply there are better methods of making temporal resource decisions. Those methods are, of course ones that employ various methods of government intervention--fiscal and regulatory. That this view is not universally shared is obvious to the student of today's literature in the areas called the economics of property rights and public choice economics. I hope to acquaint you very casually with the main currents of this heterodoxy.

The arguments developed in this section do not relate directly to the question of equity. But the tight interdependence of allocational and distributional considerations makes it necessary to consider the former. For no one suggests that equity ought to be pursued without regard to costs and benefits.

Three Sources of Market Failure?

Generally, public intervention in the resource area is urged to correct various private market impedimentia. These cause the future use of a resource to be undervalued and, perforce, its current exploitation to be excessively encouraged. We shall consider three supposed sources of natural resource market failure.

The first problem derives from the supposed upward bias in the private discount rate. Armchair economists, especially the Victorian English doctors of my science (Jevons, Sidgwick, Marshall and Pigou), took it as given that man was "myopic," i.e., irrational, in his preference for goods and services at present, instead of in the future. This unwillingness to pay a dollar today for a dollar received tomorrow or even more distantly was thought of as a moral imperfection. For it meant that people did not treat each moment of their lives as equally important. Today, few take this criticism seriously. Not even the professed socialist and Nobel anointed economist Kenneth Arrow holds that people are irrational because they exhibit such a preference for present over future.

Two reasons are largely given for this. First, if human nature is generally myopic, there is little that the enlightened can or even should do. After all, **degustibus non est dispuntandum**. This has another implication as well that I call the "liberal resignation;" namely this psychic discounting bias, if there really is one, must carry over to decisions in all institutional forms, collective as well as private ones. Second, even if this "myopic" time preference did not affect savings decisions, there still would be the positive productivity of capital to consider. Thus, even if the quantity of savings were totally unrelated to the interest rate, a positive rate of discount would still emerge because of the positive productivity of investment at the margin.

In fact, new studies by Johnson and Libecap (1980) establish that timber markets are "efficient," i.e., exhibit characteristics consistent with rational decision-making. Berck (1979) offers evidence suggesting that the implicit before-tax rate of discount is only 5 per cent. Since Arrow (1976) suggests that 10 per cent is the upper-bound of the socially efficient rate, this can be taken as evidence that the future values of the resources are being properly weighed vis-a-vis its current use.

Perversities of the tax system

Tax systems certainly can affect the timing of resource exploitation. The value of a resource in the future is its gross value in that market less all expenses incurred in its capture and delivery. This net sum is discounted from each future period by the ratio $(1/1+r)^t$, where r is the discount rate and t the number of future years from the present into the future. Thus, if a resource had a net future value of $10,000, but r is .05 (there is a 5 per cent discount rate) and t is 10, its present value would be only $6,139. Tax considerations will, of course, decrease this value. But since they lower the present value of exploitation today, there need be no distortion here, at least none unique to natural resources (Harberger, 1974a; 1974b).

Suppose, for instance, there is an x per cent tax on net returns. If it applies in the current period, $t = 0$, as well as the future period mentioned, where $t = 10$, then the optimal time for exploitation will not change. Both values will be depressed by the same percentage. If, however, "depletion allowances," encourage present over future realizations, what is one to say? If the fiscal arm of the government is subsidizing too early a usage of a non-renewable natural asset, is one to suggest the creation of another public agency or regulatory enterprise to correct his bias? In fact, this sleight-of-the-visible-hand is suggested by many policy-oriented analysts. But, of course, a more sensible solution is to amend the source of the misallocation, the tax law itself.

Problem of the "commons"

The third putative source of misallocation is the problem of the "commons." Here incomplete, even absent, private ownership of a resource makes a claim on all or part of its

income flow difficult, if not impossible, to enforce. Garret Hardin's "Tragedy of the Commons" analysis (Hardin, 1968) is widely known. But let me offer a short example. Suppose that there are n private users of a forested area. Each considers carefully the cost of cutting today or tomorrow and the attendant returns on his share of the resource. Since there is no reason owners should be systematically biased in their individual judgements the outcome is one that maximizes the overall value of the timber resource.

Now assume, however, that the watershed system is very large compared to the individual ownership package; and that it will be degraded as a result of the timber harvesting. Each owner will not consider erosion and flood risk from his clear cutting, because these effects spill mostly into the commons, i.e., onto the lands of the other n-1 owners. Of course, if each of the other owners could enforce his right to maintain soil quality on his own parcel this would not be the case. In the "commons" example, however, such precise private property rights' definition and enforcement is not possible because of expensive private legal costs.

The typical solution offered to this "commons' tragedy," is either to regulate property or even collectivize it. The thought of privatizing the resource by creating larger scale units and thus taking them out of the commons, or more clearly specifying individual property rights, has not been considered by the public at large. (However, sell-offs of U.S. federal public lands in smaller chunks in a Reagan program now known as "Asset Management" is receiving widespread discussion, but hardly much public acceptance.)

The problem with regulation or socialization is that these solutions involve putting property into the "political commons." As has been documented (Borcherding 1982, 1983), the costs of public ownership of property and public regulation of private land (Borcherding, 1976), are quite high. These "solutions" encourage new sorts of misallocation as individuals strive to appropriate and employ publicly-owned resources for their own narrow ends. Usage in the political commons dissipates wealth as surely, and perhaps even more completely, as in the anarcho-private commons. This is now well understood (Buchanan et al., 1980). This "rent-seeking" proclivity, the quest for publicly-provided transfers, is encouraged by the instrument of public lands and government regulation of private natural resources. This occurs to such an extent that those who have studied the question in depth,

(Baden and Stroup, 1981; Beckwith, 1981; Smith, 1981; Smith 1982) have suggested a European-type solution. Here, rights to private land are both encompassing over area and more detailed than in North America. The state could persuade owners, by use of easements, to take into account certain remaining commons values, e.g., amenity and fugitive wildlife considerations, into account. Contracts to preserve scenic and recreational values could be arranged through user charges in ordinary markets. This is so because many of these values are private in nature, i.e., involve little spillover to non-users.

This private contracting assumption is quite controversial, however. For "users" are hard to identify and even define. If a person never uses recreational or wildlife areas, but still places an "option" value in knowing that they are there, how could a private entrepreneur capture these ephemeral, but perhaps, **in toto**, large benefits? For this reason Stroup and Baden (1982) have suggested that title to certain key wilderness endowments and other federal monuments be transferred to private non-profit organizations such as Friends of the Earth, the National Wildlife Association, the Sierra Club, and the like. These societies would have the right to partition the property rights of said resources still further into sub-uses. They could sell or lease some of these more atomistic rights to private users. Since these latter benefits would redound to the association in question, there would be more attention paid to the marketable aspects of the resources than currently is shown by the U.S. Department of Interior and the U.S. Forest Service. As well, preservationist values would still be taken into account.

The cost of political pollution of the current regimen has been noted by many. Studies have been done by Resources For the Future and middle-of-the-ideological-road author Marion Clawson (1982), as well as by those of more libertarian persuasions such as Gordon Tullock (1982) and Barney Dowdle (1981). These scholars find that the land ownership of the U.S. federal government, 20 per cent of all land and 25 per cent of all forests, has a current market value of between 0.5 to 1.5 trillion dollars. This amounts to $3,500 to $10,000 per U.S. family. Incredibly, the absolute returns today on the marketable rights of the land and natural resources are not even zero, but negative, by about one billion dollars worth.

Government Land Ownership Excessively Wasteful

What accounts for this massive waste? Several reasons have been given by Tullock, Dowdle, V. Smith, Baden (and others at the Center for Political Economy and Resources), Clawson and myself to explain this scandal. First off, the political oversight by voters, the general interest group in society, is very weak for well known reasons. It does not pay any one unorganized individual to become informed when he has little influence over political outcomes. Thus, ignorance by the general group of their individual and collective interests is a hard cost to overcome.

Second, and following from the first, special interest concerned with environmental concerns are overrepresented because of organizational economies they enjoy. The diffuse and general group is too impotent to gain political attention, though President Reagan is certainly trying (Hanke, 1982), with no great success. But small compact interest groups facing big per capita gains can impose huge aggregate losses on the groups larger in numbers, but smaller in per capita terms.

Third, public managers are sensitive to politically derived criteria of success, not to changes in market-equivalent social wealth. The cost of public enterprise is almost always 20 to 100 per cent higher than its private equivalent. (Borcherding, 1982; 1983). No public manager thinks this is wasteful, however. For those cost differences represent transfers to politically advantaged interests that monitor him as closely as capital markets mind the managers of private firms.

Finally, public officials and public managers are much more shortsighted than private owners and their agents. The insecurity of public office gives the elected official only a temporary usufruct over state property. It is personally prudent, i.e., rational, for him to concentrate (mostly) upon the here-and-now. The public manager, because of obedience to his elected masters, reflects this temporal myopia as well. That "holding off" usage today implies smaller agency budgets than current exploitations certainly reinforces this obedience. Were public officials and managers able to capitalize future usage values, this would not be such a problem. But if this ever came to pass, the system would be more alien to private ownership (with different owners) than it would be to regulation or public enterprise.

Let us briefly consider regulation over privately owned property--an obvious alternative to public ownership. California's Coastal Act of 1976 and its regulatory commissions have been studied closely and provide some evidence as to efficacy. Hazlett (1980) found that this gargantuan zoning act has led to huge social losses, since the transfer of coastal property from lower to higher valued uses has been considerably impaired by CCA enforcement. Particular users have been protected, but at excessive costs. For Coastal Act commissioners, like public enterprise managers, are sensitive to political not market considerations (Frieden, 1979).

III. THE INTERGENERATIONAL EQUITY ISSUE

> For it is easier for a camel to go through a needle's eye, than for a rich man to enter the kingdom of God. - **Gospel of St. Luke**, 19:25.
>
> The more one considers that matter, the clearer it becomes...redistribution is...less a redistribution of free income from richer to the poorer, as we imagined, than a redistribution of power from the individual to the State. -Bertrand de Jouvenal, **The Ethics of Redistribution.**
>
> If somebody can afford to drive from New York City to Yellowstone, they can afford to pay more than $3 per carload. - James Watt, **U.S. News and World Report.**

Public Ownership and Social Goals

One cannot come away from the perusal of the studies of the allocative effects of the socialization of natural resources, by public enterprise or by regulatory fiat, and feel confident that the sum of social incomes are enhanced by employment of these instruments. As Professor Earl Thompson of U.C.L.A. has noted on a number of occasions, this substitution of public for private property rights considerably attenuates the incentive of those charged with managing the resources to count costs fully. As well, special interests are disproportionally rewarded when political assets dominate

market consideration. This is not in and of itself a bad thing --if desired social goals were enhanced that could not otherwise be attained privately. For instance, military tactical/strategical decisions as well as their attendant operations could, in principle, be contracted out to private firms. But the difficulty of legislatures writing and enforcing efficient contracts with private suppliers makes a political solution employing a public defense department even more palatable. This is true even though "everyone knows" how inefficient military bureaucracies are. The loss associated with high supply cost is thought to be more than made up by benefits of political control on the policy side of the equation. (How vertically integrated defense departments should be below the policy formulation level is, however, a matter of some contention (Borcherding, 1982; 1983).)

An Outstanding Price

There is, as one can imagine, much dispute over the optimal way natural resources should be directed. It is clear, however, that many of the public goods involved--clean air, watershed and wildlife management, parks, etc.--could be and have been privately managed by individuals either as owners or as managerial agents contracted by public authorities. The price paid for U.S. public management of public lands is simply astounding. It is at least equivalent to the foregone which could be earned on dividends, a present value of between 0.5 to 1.5 trillion U.S. dollars. Still, if there are some desirable offsetting income distribution effects, perhaps this socialization of ownership could be accepted. This would mean, of course, that (a) there is some general agreement about what is an equitable distribution of income and (b) the economic alterations accomplished by the public means actually redistributes according to the ethical criteria developed in (a).

I will not attempt to do even a thumbnail sketch of modern theory of income distributional ethics save to say that variants of the "justice as fairness" methodology developed by philosopher John Rawls (1971) seem to have gained the greatest scholarly acceptance. Essentially, this approach asks people to choose rules for redistribution based on their enlightened self-interest. To affect such a motivation individuals are asked to choose these rules behind a "veil of

ignorance" in a pre-social contract setting. Thus, redistribution becomes a type of social insurance to avoid the consequences to individuals from dreadful and unforeseen alterations in social states. The detailed operation of this fairness principle, a willingness of men "to share one another's fate" (Rawls, 1971), is a matter of much debate. A huge literature has developed around its interpretations. Nevertheless, one restrictive ethical consensus does emerge from these writings; to wit, the state ought not be used to transfer income from the less advantaged to the more privileged.

Conservationist Policies Favour the Wealthy

On this last criterion public natural resource policy looks rather piratical when only the current generation is considered. As conservation historian Samuel Hayes (1959) notes for the past, and Hazlett's aforementioned review of the California Coastal Commission indicates for the present, the effects of conservationist policies decidely favour the wealthy in society to the harm of the poorer classes. As illustration, Frieden (1979) points out two interesting things about the Sierra Club, one of the oldest of all environmental pressure groups (founded 1890). First, it is decidely urban and upper-middle class in its composition. Second, and more to his point, its membership has clearly indicated in surveys (60 per cent in agreement) a complete disinterest in the environmental problems of the urban poor or disadvantaged ethnic majorities in non-urban settings. Deacon and Shapiro (1975) and Shapiro and Barkume (1974) give ample evidence for this with respect to the operation of California's Coastal Act and Santa Barbara's environmental zoning regulation. The rich gain, the poor pay--a sort of inverted social democracy.

Why is this? Public choice scholars point out that in an orderly society the state is the only legitimate means of redistributing income and individuals in cohesive groups will employ it for their own selfish purposes. The "suppliers" of these redistributions, the victims in the general group, are, perforce, less cohesive. In the present case, the poor, i.e., the social group with much lower than median family incomes, are at an added disadvantage when dealing with the more patrician group. This is because of the latter's superior access to informational channels and better social and politi-

cal "connections" in general. This is reinforced by the political indifference of the lower income group, manifested by their lower rates of political participation. Lewis Lamphan puts it unequivocally: "The environmentalist movement is a rich man's cause.... The Club of Rome discovered the limits of growth while gathered on the terrace of a villa overlooking a hillside belonging to its founder" (Hazlett, 1980). Frieden is even more blunt, but accurate, when he refers to the Sierra Club as the "alter ego" of the California Coastal Commission staff.

IV. THE WELFARE OF FUTURE GENERATIONS, NATURAL RESOURCES AND THE INSTRUMENTS OF POLITICAL CHOICE

> For they all seek their own.... - St. Paul, **Epistle to the Philipians,** 2:21.

> Now the contract doctrine looks at the problem from...the original position. The parties do not know to which generation they belong.... The view of ignorance is complete in these respects. Thus the persons in the original position are to ask themselves how much they would be willing to save at each stage of advance on the assumption that all other generations are to save at the same rates. That is, they are to consider their willingness to save at any given phase of civilization with the understanding that the rates they propose are to regulate the whole span of accumulation. - John Rawls, **The Theory of Justice.**

> One problem with this new political alliance (environmentalists and wealthy homeowners) is that it lends the legitimacy of an environmental crusade in the public interest to what is otherwise a selfish and provincial concern. - Bernard Frieden, **The Environmental Hustle.**

Resource Policies Hinder Future Generations

A typical statement of aim to help future generations by current environmental and natural resource policy can be

found in the preamble to any agricultural land conservation act. Keeping land in agriculture via restrictions in its transfer to other usages is said to insure against "shortages" in such land later on and the attendant price increases in agriculture products that a free market would otherwise permit. Consider a clear statement found in a 1979 study by the National Agricultural Lands Study group and cited by Pasour (1982):

> How can we direct urban development to less productive acres, and thereby protect our irreplaceable prime farm land acres from further encroachment?

The advantages of private markets

Most economists would suggest that private markets be employed in this regard. For the greed of private owners will lead them to consider the value of land assets both in their agricultural use and in other alternative occupations. Bureaucrats and politicians, on the other hand, will consider the political returns in each alternative use, now and later. As I have stated earlier, however, congruence between political payoffs and underlying social values is tenuous, though there are those, e.g., Solow (1974) and Bjork (1980), who hold that land and resources markets are even poorer proxies.

We shall not for the moment press those who claim that we need more "planning" (public planning, that is) and greater government ownership and regulation of natural resources. Let us grant them the premise of their argument and ask instead if their preferred policies will really transfer income from the current to the future generations. Suppose, further, one assumes that these various strains of natural resource policy do, in fact, create net wealth for the next generation. All would then agree, I believe, that these current collective acts represent increments of social savings in the form of public bequests. But these changes are closely interrelated to private bequests, and following Becker (1974), will affect the decision of individuals in the current generation to pass on their private wealth. I would, therefore, predict that members of the current generation finding themselves forced to make (putatively efficient) savings through public means, will choose to consume more of their private assets today to offset the additional public bequest.

Let us give an example of this substitution. Suppose individual A planned to bequeath an asset worth $1,000 to his heirs, B, in a future generation. Now the state intervenes and creates a political instrument that transfers $100 to B. In such a case, A will tend to amend his will and leave B a bequest of only $900 (perhaps a bit more as he feels wealthier by this act of efficient state intervention).

Of course, if we drop back into the real world of the fallible and venal polity, these offsets may not be dollar for dollar. Actually, they could be the very opposite. If the state offers B $100 but in the process takes $200 from A in an inefficient intergenerational transfer scheme, A will reduce his bequest by more than $100 as he is now a poorer man and poorer men leave smaller estates. Since the likelihood of inefficient intergenerational transfers is at least as high as efficient ones, a dollar-for-dollar substitution is a very conservative expectation.

But this covers only the "supply side" of the public-private savings-investment decision. If one considers the substitution effects among the private demanders of investment, another sort of problem ensues.

The Offset Problem

There are a great number of "hard" and "soft" magazines--for example, those which run the gamut from the **Journal of Land Economics** to **National Geographic**--which deal with this question. They tend to assume a that a public decision which increases agricultural land and wilderness areas or perhaps stretches out the timber-harvesting cycle over a longer period is the equivalent to an increase (or a reduction in its depletion) in that type of resource for society as a whole. As in **Genesis** where Joseph's dream leads to net accumulation of grains and storeable foods during the seven years of plenty, these writers believe that their visions, or more to the point those of some government bureaucrats and officials, are neither shared nor considered by non-governmental decision-makers.

That may have been the way the world worked in the Egyptian proprietary state of Pharoanic times, but it certainly is not the way it works now. Suppose private investors put away a silo full of corn with the expectation that it will be worth something more than the various holding costs (includ-

ing foregone interest). If so, a public decision to supply another silo of this grain for future sale will tend to lead private investors to reduce their accumulation by one silo's worth. Thus, the market will offset many resource investment decisions undertaken by the state.

There are two exceptions to this investment substitution effect. One is when the public accumulation of resources (or its equivalent, the postponement of resource consumption) is socially worthless, i.e., it is viewed by the market as having a zero supply effect. The second is when the accumulation involves a resource that is valuable, but would not in the absence of government intervention be provided by private suppliers. Clearly, fishing and hunting areas, grazing lands, parks and recreation areas and mineral developments, do not belong to this second category (perhaps wilderness areas, too, though I would not press this without more study). It follows in general, I believe, that except where there are real public goods involved, not provided by private suppliers, private resource investments offsets are to be expected. To what degree this characterizes the bulk of U.S. federal lands I cannot venture with great certainty other than to harken back to Clawson, Dowdle, Stroup, Baden, and Tullock who argue that federal lands are largely an inefficient instrument of redistribution involving very private goods.

The curmudgeon

Thus, it seems difficult to pass on net assets to the future generations beyond that which individuals qua family members desire. What, however, of individuals who do not care one way or another about the future generations and plan no bequests? Will they not have their "share" of public assets transferred to the future generations by the aforementioned public natural resource policies? I am not sure they will, since these politically created transfers have current asset complements whose prices ought to rise.

Consider, for example, a public park. Its creation raises the value of private inputs used in conjunction with the park, e.g., motels, restaurants and stores. People have to have places to eat, sleep and, because of their propensities "to truck, barter and exchange", to shop as well. Thus, things which enhance the future value of a public park raise the future value of those complementary activities consumed

along with park services. It follows, therefore, that some of those future transfers will be recouped by the current generation. Since some of this group is indifferent to the future generations, public transfers are again self-limiting.

The Alberta Heritage Savings Trust Fund

One particular form of social savings is worth looking at with this simple economics in mind, Alberta's Heritage Savings Trust Fund. (Alaska's smaller, but still significant, Permanent Fund could be similarly analyzed). Alberta has received considerable revenues from its publicly-owned oil leases and royalty receipts. Rather than distributing all this resource income to its current citizenry, the AHSTF was created (a) to spread these benefits temporally between current and future citizens and (b) to reduce risk over time by investing the undistributed earnings in varieties of private activities outside the resources area.

About the success of the second aim (b), I shall not comment except to say that because of a host of political constraints, the realized rate of return to the AHSTF has been considerably less than prudent individual investors would generally earn.

As to (a), it is becoming obvious that distribution to future generations is virtually a hopeless task. To obtain the current and future benefits of the fund one must only become a citizen of the jurisdiction. Since, however, citizenry in a province is available to any immigrant who is a citizen of the larger Canadian federation, the limiting in-migration factors are the rising price of housing and other amenities that are complementary with state/provincial citizenship. As well, there is the reduction of wages.

Owners of specific capital complementary to in-migration labour have clearly gained a great deal. Thus land, capital and labour market price changes capture and often capitalize much of the future transfers. This offsets the efforts of this petroleum wealth jurisdiction to transfer benefits to future generations. Because real resources are used in the migration process, however, much of the value of the AHSTF is dissipated by migratory rent-seekers. Thus, there is little in the way of **net** future transfer, but a great deal of inefficiency in its pursuit.

McMillan and Norrie (1980) ask, sensibly, why is it that the collective decision has been made to transfer the ownership of Alberta's petroleum resources so inefficiently from present to future generations? At best, they imply, this is a futile and probably wasteful endeavour. The answer is that the public allocation allows a greater control by bureaucrats and special interests over the resources. Consequently, this enhances their respective wealth positions more than would an outright privatization.

As an interesting aside, Alaska opted in referendum for a (complicated) distribution of its Permanent Trust Fund to its existing citizenry. This, however, was interpreted as violating U.S. and state constitutional guarantees of non-discrimination between citizens. Thus, U.S. courts have acted to maintain the resource in the political commons when otherwise a (partial) privatization would have been accomplished.

The present discussion does not preclude the possibility of a collective (public good) motive for state resource redistributions to the future (Marglin, 1963). However, following Tullock (1964) I doubt this motive is very strong. Individuals as members of families already bequeath a great deal of property to their own progeny. Thus, for whatever reasons, cultural altruism and/or genetic selfishness, individuals act **as if** they subscribe to the Rawlsian intergenerational contract.

But why would such motivation extend beyond the family unit to engage in intergenerational charity? After all, in a society where the Bs of my previous example are on average much richer than the As, the impetus for A-type individuals of one family group to give to B-type persons in another family unit is probably rather small. The poor do not, voluntarily at least, feel incumbent to contribute to the rich. Thus, my second question, "Should the current generation publicly provide for the future generation?", would seem to be answered in the negative.

The Morality and Economics of Redistribution

In much of the literature on other aspects of government intervention, the moral as well as economic difficulties of affecting public redistributions of wealth is now a major theme. These concerns link rather well, if not seamlessly,

predictive economics with the modern theory of ethics. This holds whether they are in a Rawlsian pro-redistributional setting or based on Nozick's radically restrained concept of the "limited state" (Nozick, 1974). They all remind me of a much earlier prediction by one of the founding members of the Mont Pelerin Society, Friedrich A. Hayek (1960). This nicely combines the liberal-individualistic ethics which are part of the new moral philosophy with the hard-nosed economics of contemporary public choice/property rights analysis:

> The principle of distributive justice, once introduced, would not be fulfilled until the whole of society was organized in accordance with it. This would produce the kind of society which in all essential respects would be the opposite of a free society--a society in which authority decided what the individual was to do and how he was to do it.

Irving Kristol (1978), that most articulate neo-conservative, sees it correctly in my opinion. He states:

> (The advocates of) democratic socialism...like to think that it can "socialize" the economic sector while leaving the rest of society "liberal".... (T)he trouble...is that democratic socialists, when elected to office, discover that to collectivize economic life (to realize their distributional ends) you have to coerce all sorts of other institutions....

This "road to serfdom" is (mercifully) reached slowly, but it follows from the economic principles of general equilibrium that if goals of redistribution are not rather modest, its consequences will be realized sooner or later. Those who advocate a further transfer of ownership and control of land and other natural resources to the state should consider the side-effects of their ethical distributive policy preferences more carefully. These transfers are, on the whole, not only allocationally inefficient but distributionally perverse as well.

V. POETRY AND REALITY

> In wilderness is the preservation of the world. - Henry David Thoreau, **Walden.**
>
> Today, unfortunately, we have two extreme and needlessly hostile groups: those who speak scornfully of the "wilderness cult" and consider wilderness value a witless return to primitivism, and those who talk about "escaping to the wilderness" as if all man-made landscapes were false and ugly. - Paul Brooks, **Speaking for Nature.**
>
> If men agree on rights, the problem of social order is largely resolved. - James M. Buchanan, "Utopia, the Minimal State and Entitlement," **Public Choice** (1975).

Leftist theory--and reality

When I was a young man in graduate school (and still a happy pro-interventionist), I asked a question of one of my wisest and most distinguished professors: Why do all the good folk songs not connected with love and death have leftist themes? I do not recall his answer as very satisfactory, possibly because this scholar was not much addicted to coffee house or beer parlour music. But the answer is clearer to me today. Poetry need not be constrained by reality. Individuals dealing with "free" resources or the equivalent, resources that are not their own, are like poets treating a fanciful subject--sentiment counts, cadence counts, texture and form counts, but substance becomes boring, extraneous detail.

"Rational expectations," on the other hand, naturally dominate where participants are regularly subjected to reality testing. Where links between action and payoffs become more tenuous, the social "play" between perceptions and reality becomes much greater and theories become more romantic.

Special interests use such slack in understanding to their advantage. In contrast, "honest" political entrepreneurs representing the general interest have a hard time gaining credence for their arguments in a world where almost everyone is dissembling. Not only is it difficult for their messages to be distinguished as authentic, they have a great deal less incentive to produce them, since truly general interest payoffs are so hard to capture by the politician who seeks them.

Nonetheless, society does pay for thinking on policy subjects, or "preaching" as George Stigler (1982) calls it. Suggestions for superior institutions sometimes (rarely?) do emerge from the subsidized pens of academics or the responsible and highly charitable gentleman-scholar. Most such musings are useless, silly or even fraudulent. None offers any warranty, nor are they actionable when proven positively destructive.

Suggestions for Reform

Thus, it is with some trepidation and even less expectation that I offer even modest suggestions for reform in the natural resource policy area. I take several things as given over which my audience will be forgiven if they quibble. First, like it or not, resources now in the political commons are really "owned" by special interest groups who will not willingly give them up without compensation. Second, compensation to these owners to accomplish real reform is quite difficult. When a compensation plan is announced, many "non-owners" will feel the call to collect. Third, the average citizen never sees the gain that accrues to him from a political alteration in rules of conduct with the same clarity and certainty as the author of the suggested reform. This follows from both the citizen's rational ignorance of its consequences, and prudence, a perception based on a host of past disappointments. The general citizenry's expectations are particularly low. This is understandable when it is recalled just how much deception is practiced by special interest advocates parading their proposals as furthering the commonweal.

Thus, I believe that acceptable reforms will hardly ever be radical in such a world. My suggestions are very limited indeed when compared with those of experts in the field such as Richard Stroup and John Baden (1982), Gordon Tullock (1982) and Vernon Smith (1982). Mine are closer, I am sorry to say, with those of Resources For the Future and Marian Clawson (1981):

Proposals for the Future

I propose a hodgepodge of alterations. These include (1) a small initial sell-off just as President Reagan has suggested. This is especially targeted toward local users (ranchers, farmers, fishermen, miners, foresters, etc.) who have had virtual squatter's (usufructory) rights for some time (Smith, 1982). As these modest sales are perceived by the public to

"work," more resistance to further disposals will be reduced. In addition to these sales, I would endorse (2) a transfer of ownership of a great deal of the U.S. federal domain to the states as the Sagebrush Revolutionaries demand. I have no illusion that state bureaucrats and legislatures will be careful and prudent agents of management; I have lived too long in Canada where Crown lands are largely under provincial domain to believe that. It will, however, encourage statewide experimentation in development of resources which should make eventual privatization easier.

Finally (3), I think it realistic (politic) to recognize the power of the grand coalition of environmental groups in setting policy over wilderness and wildlife areas. We should follow Stroup and Baden's suggestion and transfer management ownership to such organizations. (Stroup and Baden, 1982). As they point out, the Rainey Wildlife Sanctuary of the National Audubon Society is generally accepted as superior to its state and federal government counterparts. Other lucrative activities compatible with the Audubon's mandate are carried out on this property, since these revenues enhance the Society's wildlife preservation mission. One can even visualize a type of competitive bidding and operation of many of the U.S. wilderness and wildlife areas by various conservation pressure groups that approximates Demsetz's scheme in public utilities (Demsetz, 1968).

The "trickle up" effect

None of these three proposals for reasons of social interaction of private savers and investors is liable to transfer a great deal more to future generations. But by enriching the current generation through the reduction of inefficient intragenerational transfer, it makes it more likely they will be more generous with future generations. Like it or not, with intergenerational decisions all society really has is this "trickle up" effect.

Sir Henry Maine notes that the march of civilization is slow and marked by a progession from societies based on status to those based upon contract. In point of fact, societies are for a number of historic, cultural and political reasons admixtures of status and contract, depending on the activity in question. Passage of time can be associated with all sorts of changes, depending on the alteration in the factors that determine the cost of social contracting.

Property in North America, John Hughes (1977) suggests, was for a number of legal and populist-oriented constraints put into the political commons, but nonetheless most has been privatized.

That one-quarter to one-third of it is still "publicly owned" today is understandable given the costs to those special interests who realize implicit and uncompensated capital losses from privatization. Thus, just as with Zeno's paradox, society may be able to realize only a portion of the potential larger product from alterating the employment of publicly owned or regulated assets. As long as pathways to realization of efficiency gains are constitutionally protected by competitive political institutions, and so long as individuals are reasonably trustful of each other, privatization will continue.

If I read the Bozeman writers correctly, however, they fear the political competition has been stifled or severely attenuated by a sort of environmental oligopoly. Thus, it is depressing to consider the limited scope of improvement possible in any society, but only because of rational individual impatience (time preference). The pay-offs to the present generations are never very high from any real long-term improvement. Instead, they come in distant times and in unexpected ways. It is these future improvements that are the true public goods that can be collectively transferred to following generations. As individuals representing the current cohort, the best we can do is to propose improvements cheerfully and "conservatively"--and not be offended when our suggestions are ignored.

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THE MARKET PROCESS AND ENVIRONMENTAL AMENITIES

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CONTENTS

I. INTRODUCTION

No other field of economic inquiry, with the possible exception of industrial organization, has focused more on market failure and its implications than has natural resource economics. In a leading textbook on the subject, Alan Randall (1981, p. 42) states that:

> resource economics...raises questions about the effectiveness of existing market and institutional structures in allocating resources, in adjudicating among the claims of individuals in the present generation and adjudicating among the claims of present and future generations.

In general, resource economists have focused on problems of externalities and public goods. Solutions requiring governmental intervention are then proposed and analyzed to determine what taxes, subsidies, and regulations will improve efficiency.

Starting from a perspective of Pareto optimality, most textbooks focus on why such an optimum will not or cannot be achieved through the market process. Charles Howe (1979, p. 103), for example, uncovers what he believes to be a "number of reasons why even well informed competitive markets may fail to allocate resources in the socially, most desirable way over time." His list includes:

1. Private markets are likely to overlook the values of environmental services related to stocks of in situ resources.

2. Private interest rates are likely to be higher than appropriate social rates of discount.

3. Common access to in situ resources may preclude the establishment of markets for these resources.

4. Future production cost savings related to carrying stocks of in situ resources may be spread among many producers in common pool resources, causing producers to ignore or undervalue such savings.

5. Monopoly will generally result in quite a different time pattern of resource use than a competitive market, but this pattern may be closer to the optimum pattern than the competitive one.

In general, most of the arguments on market failure centre on the divergence of private and social discount rates or private and social costs. Following a Pigovian tradition, economists have tended to see externalities as pervasive cases of market failure calling for governmental intervention. In the textbook that dominated college courses during the 1960s and 1970s, Paul Samuelson (1980, p. 450) states that:

> **Wherever there are externalities, a strong case can be made for supplanting complete individualism by some kind of group action....** The reader can think of countless...externalities where sound economics would suggest some limitations on individual freedom in the interest of all.

From this perspective, it has been easy to justify governmental intervention in the allocation of almost all natural resources, including land, air, energy, timber, water, and agriculture. Unfortunately, "the Pigovian analysis contains an implicit bias toward 'intervention solutions' for externalities in the form of taxes, subsidies, regulations and prohibitions" because it suggests "that externalities necessitate 'corrective' government action" (Burton 1978, p. 90).

This approach has recently been criticized and challenged. Stimulated by Ronald Coase's article, "The Problem of Social Cost," economists have begun to incorporate property rights and transaction costs into their analysis of market processes. Particularly in the fields of industrial organization, public choice, and economic history, this new brand of institutional economics is generating a body of

literature that is changing the way we think about government and its role in the market system.

This paper will attempt to help expand the list of such fields to include natural resource economics. A few economists are beginning to recognize the importance of the new institutional economics to the study of natural resources, and the result is an emerging new resource economics paradigm (see Anderson 1982). Section II of this paper briefly states the elements of the new paradigm. Section III provides examples of how the new institutional economics can be applied to resource problems. It suggests alternatives to the interventionist solutions derived from the Pigovian analysis, and presents evidence that market processes can provide environmental amenities.

II. THE NEW RESOURCE ECONOMICS

In examining the "myth of social cost," Steven Cheung (1978, pp. 67-68) concludes that:

> The question is...why public policies exist in the way they do and why they vary in different economic systems. The answer to this question of the economic interpretation of political behavior requires an understanding of the real-world constraints relative to government decision-making. A recent shift of interest in that direction and a growing recognition of the importance of the analysis of politics, presage a new momentum in the development of economics, particularly in industrial organization, public choice and economic history.

In these fields, emphasis is being placed on the relationships between principals and agents and the effect that transaction costs have on these relationships. As a result, economists are rethinking the concept of monopoly, reconsidering the behavior of bureaucracies, and asking how and why institutions change over time.

Even more recently, natural resource economists have begun to apply the transaction cost/property rights tool to their analyses. Antony Fisher (1981, p. 54) captures the essence of the change:

> We have already abandoned the assumption of a complete set of competitive markets...but if we now similarly abandon the notion of a perfect planner, it is not clear, in my judgment, that the government will do any better. Apart from the question of the planner's motivation to behave in the way assumed in our models, to allocate resources efficiently, there is the question of the ability to do so.

The new institutional economics approach is giving the kind of rigorous, theoretical, and empirical attention to governmental failure in natural resource allocation that previous efforts following the Pigovian tradition have given to market failure. Using this approach, it is clear that

> it is not sufficient to compare the performance of either the market or a nonmarket mechanism against an "ideal," "optimum," or "theoretical" standard and conclude that it is inappropriate for policy purposes. Market "failure" in some abstract sense does not mean that a nonmarket alternative will not also fail in the same or in some other abstract sense (Castle 1965, pl 552).

Methodological Individualism

The new resource economics begins with the individual, especially the entrepreneur. Following marginal analysis, entrepreneurs search for situations where marginal benefits exceed marginal costs. As they respond to opportunities, the system moves closer to equilibrium. The question is whether the opportunities they discover and the actions they take will increase wealth for society or simply redistribute existing wealth.

The answer to this question depends entirely on transaction costs and the resulting contracts. For entrepreneurs to face the full opportunity costs and reap the full benefits of their actions, there must be explicit or implicit contractual terms for all relevant margins. It is the structure of property rights and the cost of specifying, measuring,and enforcing contractual terms that determine resource allocation.

It is also important to recognized that as the values of resources change and as new technologies are developed, different margins will be specified in contracts. Higher resource rents will induce entrepreneurs to accept the contracting costs that were too high given previous values. Similarly, new technologies can reduce the costs of specifying, measuring, and enforcing contractual terms. Both phenomena were at work in the evolution of property rights in the American West (see Anderson and Hill 1975), and both are influencing the provision of environmental amenities through the market process.

When property rights are not well-defined, enforced, and transferable, or when transaction costs are high, the entrepreneur has at least two opportunities for increasing his wealth. First, consider the economics of a common pool. Cheung (1970) has shown how entrepreneurs faced with a common pool resource dissipate rents. Because of high transaction costs certain marginal impacts will not be the basis of contract. Exploiting a resource under these conditions benefits the individual, but is a negative-sum game for society.

Entrepreneurs also play negative-sum games when they engage in rent seeking that uses the coercive power of government to increase personal wealth at the expense of others (Anderson and Hill 1980). In the context of new institutional economics, rent seeking means that entrepreneurs will engage in efforts to raise transaction costs for their competitors or to redefine property rights in their favour. Both of these actions require governmental action. With so many decisions on natural resource use placed in the hands of state and federal bureaucrats, the rent-seeking game is important for coal company executives as well as environmental leaders. Both types of entrepreneurs recognize that their wealth and the wealth of their principals will be affected by bureaucratic decisions. Hence, interest groups spend large amounts of money and other resources trying to influence these decisions.

Rent Seeking

While such entrepreneurial efforts expain rent seeking, the activities of politicians and bureaucrats explain the supply. Just as entrepreneurs in the marketplace recognize and fill demands for goods and services, politicians and bureaucrats

discover opportunities to meet the demands of their constituencies. The constraints on each, however, are very different. With well-specified contracts, private entrepreneurs provide new goods and services only when they expect the benefits from those goods and services to exceed the opportunity cost of resources used in their production. Politicians and bureaucrats who provide goods and services to interest groups, however, do not have to pay the full opportunity cost of expended resources. They can increase their own utility by increasing budgetary discretion, power, and wealth.

There is a principal/agent relationship between politicians and bureaucrats on the one hand and voters on the other. But this is weakened by such things as voter ignorance, imperfect information, and special interest effects, which raise the transaction costs of fully specifying contracts between governmental agents and citizen principals. By explicitly incorporating these costs into our models, we can better understand which situations are likely to result in governmental failure.

Natural resource economists who follow the transaction costs/property rights approach question whether allocation problems can be solved simply by asking governmental decision makers to equate benefits and costs at the margin. As Friedrich Hayek (1972, p. 91) states,

> The problem is thus in no way solved if we can show that all the facts, if they were known to a single mind...would uniquely determine the solution; instead we must show how a solution is produced by the interaction of people each of whom possesses only partial knowledge.

From this perspective, the real question is: What are the relevant contractual margins and what values will be placed on them?

The new paradigm is certainly having an impact on natural resource economics and policy, but developing a new theory is not enough. If "Pigou's contribution to the economic theory of government policy was based on armchair theorizing, rather than empirical investigation" (Burton 1978, p. 72), it is important that the new resource economics not fall into the same trap. The property rights and transaction cost constraints that are assumed must be carefully examined to see if they are valid. Then empirical investigations must

be conducted to ensure that the findings are true. Guidelines for conducting these investigations are provided by Coase's (1974) evidence that lighthouses are not public goods and Cheung's (1973) examination of contracts between beekeepers and orchard owners.

III. FREE MARKET ENVIRONMENTALISM

Those who follow the Pigovian tradition are willing to acknowledge a property rights solution to some problems. But they generally argue that such a solution could not possibly work for water, amenity, and wildlife allocation.

> With respect to bodies of land and water, extension of property rights may effectively internalize what would otherwise remain externalities. But the possibilities of protecting the citizen against at such common environmental blights as filth, fume, stench, noise, visual distractions, etc. by a market and property rights are too remote to be taken seriously (Mishan, p. 62).

But voluntary, contractual solutions to many environmental problems can and do evolve. When they do not, transaction costs can be blamed for the failure. These costs may not simply be those associated with standard market transactions, however; they can be the result of governmental action designed to correct the alleged market failure. Consider the following examples of how the market provides environmental amenities.

Privatizing Instream Flows

There was little need to consider who had the rights to instream flows during the years when water rights were forming in the American West (see Anderson 1983). Since then, however, the demand for instream uses has grown to include waste disposal, recreation, and scenery. Industrialization led to the discharge of effluent into rivers and lakes, and rising incomes and more leisure time led to an increase in aesthetic values.

As instream uses began to compete directly with diversion uses, the institutional structure had to be adjusted to account for the new values. Judicial and administrative agencies responded by instituting new rules governing instream uses. The rationale is that these uses are a public good; that is, it is difficult (some say impossible) to exclude nonpaying uses, and additional units of the good can be provided at zero marginal cost. To compound the problem, it is argued that an existence value can be associated with instream amenities; that is, some people derive satisfaction from simply knowing the amenity is there. A New Yorker may be happy knowing that a free-flowing stream exists in Montana, even if he has no intention of ever seeing it. Using these arguments, policy makers have justified governmental intervention in water allocation. Is the collective action that has been used to provide for instream uses necessary, or could markets be allowed to resolve the conflicts between uses?

If we are to be convinced that markets can provide an alternative for allocating instream flows, it is reasonable to ask why markets are not more active in this area. Huffman (1983) suggests that:

> That existing inefficiencies in water allocation result from deficiencies in the private right system rather than alleged market failures. The existing water laws seriously limit private acquisition of instream flow rights, so we cannot be sure from experience that the initial public-good assumption is accurate.

In many Western states, the institutional structure precludes the private ownership of instream flows. In some cases, the concept of beneficial use--initially developed for agricultural, mining, and domestic uses--does not include instream flows. In the early mining camps, beneficial use was determined by any user who was willing to divert the water. Over time, however, beneficial use has been increasingly determined by judicial and administrative agencies, which have ruled that reserving instream flows for amenity purposes does not constitute a beneficial use.

Beneficial use

The requirement that beneficial use necessitates the diversion of water has produced perverse results. For example, when the Colorado legislature authorized the Colorado River Conservation District to reserve water for instream purposes in any natural stream large enough to support a fish population, the Colorado Supreme Court ruled that there was

> no support in the law of that state for the proposition that a minimum flow of water may be "appropriated" in a natural stream for piscatorial purposes without diversion of any portion of the water "appropriated" from the natural course of the stream (Huffman 1983).

Much earlier, in 1917, a Utah court had ruled on the disputed ownership of instream flows for the purpose of supporting a duck population. The court found that it was

> Utterly inconceivable that a valid appropriation of water can be made under the laws of this state, when the beneficial use of which, after the appropriation is made, will belong equally to every human being who seeks to enjoy it....(W)e are decidely of the opinion that the beneficial use contemplated in making the appropriation must be one that inures to the exclusive benefit of the appropriator and subject to his domain and control (Lake and Shore Duck Club v. Lake View Duck Club, 50 Utah 76,309, 1917).

The state was unwilling to allow individuals or groups to appropriate rights for the "public good." As long as the maintenance of instream flows does not constitute a beneficial use of water, private appropriators will not be able to define and enforce rights to the flows. Thus a market cannot develop. Again, this is not a case of market failure but of governmental or institutional failure.

Also hindering the market allocation is the practice in most states of forcing rights holders to forfeit rights if the water is not used. That is, if water is left in a stream to provide a nice view or a fish habitat, the law considers it abandoned and the right is lost. The rationale for this law was that speculation in water caused valuable resources to remain idle and unproductive, inhibiting economic growth.

Since water held for speculative purposes cannot be distinguished from water held for instream uses, the latter has fallen under the law of abandonment. The law stifles the establishment of instream water rights and discourages what may be a highly valued use. Removing the beneficial use restrictions and the laws of abandonment would eliminate an institutional barrier to the establishment of instream flow rights and the production of amenity values.

Private property instreams

The evidence suggests that if legal obstacles to the establishment of instream rights were removed, contracted arrangements for the private provision of instream uses would develop. On small streams, for example, where some legal restrictions do not apply, private owners are gainfully providing fishing. In the Yellowstone River Valley south of Livingston, Montana, several spring creeks begin and end on private property and are wholly appropriated by the landowners. Since access to the stream can be monitored inexpensively, landowners can collect a fee from fishermen. The fee gives owners the incentive to develop spawning beds, prevent siltation, and keep cattle away from streams to protect the bank vegetation and cover. Owners limit the number of fishermen per day so that the value of the experience is not diminished.

A rather different case but one that produced similar results occurred in the Gallatin Valley near Bozeman, Montana. A few years ago, a recreational fisherman purchased some land and a stream from a cattle rancher who had allowed his livestock to graze on the stream banks, eliminating vegetation, causing erosion, and reducing the size and number of trout in the stream. The new owner got rid of the cattle and in three years had reclaimed the stream and revived its fishing potential. The owner bears the cost of not using the land for cattle production, but he reaps the benefits of better fishing.

The results of private ownership of fishing rights are being noted in other parts of the world. On the Southwest Miramichi River in Quebec, the owner of a fishing camp described how he turned his leased section into the perfect place for salmon fishing:

> I made it perfect by rafting a bulldozer in here.... We cleared away the gravel bar that kept fish from going up the tributary...dug the hundred-yard long pool...and shoved a big-as-a-house boulder in place at the head of it.... With all due respect to Mother Nature, the pool was built by men and machines, and it seems to be as good now as it was the first year (Zern 1982, p. 87).

British experience

The rights to instream flows in England and Scotland have long been well established and encourage instream uses. The tradition of trout fishing in Great Britain has led some owners to maintain their fisheries even though they have not marketed the fishing rights. As the value of fishing rights have risen with the demand, however, "there are few landowners...who can afford to ignore the commercial aspect of the sporting rights which they own" (Southerland 1968, p. 110). It has become worthwhile to incur the costs of specifying and enforcing contractual arrangements that govern fishing. As a result, many private, voluntary associations have been formed to purchase rights to instream flows and to charge fees for fishing.

> In the 1960s and 1970s, smaller, privately managed fisheries that offered exclusivity in exchange for higher rod fees began to break out like an aquatic rash around (England). Now every city and major town...has first-rate trout fishing within easy reach and at an affordable price (Clarke 1979, p. 219).

In Scotland,

> Virtually every inch of every major river and most minor ones is privately owned or leased, and while trespassing isn't quite as serious a crime as first-degree murder or high treason, it isn't taken lightly... Many of the stretches, which may be 100 yards of one bank of a river or several miles of both banks, are reserved years in advance, with a long waiting list (Zern 1981, p. 120-36).

In Grantown-on-Spey, the angler can

> join the local angling association by paying a weekly fee about $25 and be free to fish any of seven miles of association water. Sometimes, too, hotels and inns own or lease a stretch of river for their guests or make arrangements with the local owner of fishing rights (Zern 1981, pp. 120-36).

When water for instream uses can be privately owned, there is an incentive to manage and improve the fishing habitat. In order to capture a return on the investment, owners must invest in enforcing their property rights, so the British hire private fish and game managers and invest in capital improvements on their streams.

> To maintain their houses as homes, they retained housekeepers. To keep a proper garden and park, they had groundskeepers. Game keepers for stag and grouse. Then, as keepers of the kept, even gatekeepers to further secure things. And eventually, it was for the British to devise the ultimate in the art of maintenance--the riverkeeper.
>
> Now, the name itself could easily be misinterpreted--as it has from time to time by our American "riverkeepers" whom we call "the Corps of Engineers." To keep a river from doing what it is supposed to do would be noxious to the British, as it is to many anglers (Zahner 1980, p. 16).

The British system illustrates how the United States might restructure its institutional arrangements to encourage the private presentation of instream flows. With private ownership, instream flow rights acquire a value that cannot be ignored. Southerland (1968, pp. 113-14) notes that there is no doubt

> that sporting rights are a desirable amenity...but it must be remembered that without careful preservation much of the amenity would not exist. The good-natured farmer who allows anyone to shoot over his land, and does nothing to preserve his stocks, will soon find out there is little left to

> shoot....(I)f he invests in improving his sporting amenities, he is surely entitled to make what profit he can from his enterprise. That this should result in the rationing of the commodity by prices is no more deplorable than the fact that Dover sole costs more than herring.

Reduced pollution

Even pollution can be reduced if individuals are allowed to own water within the confines of a stream's banks. Under these conditions, liability rules can and will evolve. Owners of instream fishing rights, for example, could bring suit against an upstream polluter whose effluent adversely affects their fishing resource. In England, the Angler's Cooperative Association (A.C.A.) has assumed the job of monitoring pollution.

> It has investigated nearly 700 pollution cases since it started and very rarely does it fail to get abatement or damages, as the case requires. The anglers have behind them a single fact. Every fishery in Britain, except for those in public reservoirs, belongs to some private owner (Dale 1968, p. 68).

These efforts have even preserved trout fishing on the Derwent River, which flows through the industrial city of Derby. The A.C.A. prevented the city from dumping sewage into the river and got an injunction against British Electric to stop it from running warm water directly into the river. "A.C.A. also deals with...mud running into a stream from a new road grade, or a ditch.... This is actually a good example of a common form of pollution which we (in North America) accept but which is quite unnecessary and not hard to avoid" (Dales 1968, p. 69).

State laws that prohibit the ownership of water for instream uses inhibit market solutions to instream use conflicts. If these prohibitions were removed, it is likely that we would move a long way toward reaching private, contracted arrangements for instream uses. The existence of British water institutions, which promote high quality fishing and give owners an incentive to guard against stream pollution, suggest that markets can play a greater role.

Migratory Fish and Wildlife

Even those who concur with a property rights solution to many natural resource problems often argue that in some cases such a solution would be prohibitively expensive. John Burton (1978, p. 88) concludes that

> fish-farming, for instance, is both technically feasible and commercially viable in some types such as oyster-fishing (and probably also shore-based rearing of expensive fish such as turbot and sole). But the establishment of private rights of fishery in migratory fish seems so far technically infeasible.

The fate of whales, sea turtles, buffalo, grizzly bears, and passenger pigeons provide ample ammunition for environmentalists seeking governmental control of wildlife allocation.

As with instream flows, one reason for market failure is the legal restriction on wildlife ownership. An 1896 Supreme Court ruling established the states' proprietary interest in wildlife through the state ownership doctrine. In light of the near extinction of several furbearing species, state control of wildlife seemed like the only alternative. There are cases, however, where these laws have hindered the establishment of private property rights and, hence, the investment in wildlife preservation. Nonetheless, there are a growing number of examples of markets responding to scarcity conditions in the allocation of this natural resource.

It appears that the establishment of private rights, even for migratory fish, is technically feasible. In Oregon, companies are investing large amounts of money in breeding salmon in hatcheries and releasing them into the ocean. When the salmon leave the Oregon Aqua Hatchery, they are "imprinted with a chemical odor which will guide them back to this (release) site when they are ready to spawn" (Nova, p. 8).

Private salmon ranching is not unlike the fishing institutions established by the early coastal Indians. Tribes along the coast and up the Columbia River harvested the fish when they returned to their spawning grounds, limiting the take according to tradition and superstition so there was always a sustainable catch. Resources were not expended in fishing

the ocean but were conserved by catching fish as they returned to the rivers.

Common pool salmon

When white men came to the Pacific Northwest, the ocean became a common pool resource to be exploited by commercial and sport fishermen. Efforts have been made to limit the catch in open waters and to increase the salmon population by using public hatcheries, but many resources are still being invested in trying to catch the fish that are available. Large amounts are invested in boats, nets, electronic gear, and labour, even though the fish could be harvested by channeling them directly into the cannery at spawning time. Estimates suggest that total expenditures may exceed the value of the salmon (Higgs, 1982).

Private salmon ranching is a rational alternative. A concrete fish ladder is the only piece of equipment required, and private salmon ranches catch approximately 70 per cent of their released stock. The program is still in its infancy, but it appears to be profitable and is contributing to a growing wild salmon population.

Timber companies in the South are also recognizing the potential for resource management that enhances wildlife. The Southern timber industry is dominated by private landholdings. In the past forests have been managed primarily for pulpwood, with little attention paid to wildlife habitat. It simply was not worth incurring the transaction costs. As amenity values have risen, however, companies like the International Paper Company have begun to change. White-tailed deer, turkeys, rabbits, bob-white quail, mourning doves, and other species are beginning to reap the benefits of new management techniques, and so are International Paper and hunters. Clear cuts are limited and are made in irregular, narrow patterns to minimize the edge effect. Disperse age classes of trees are improving the habitat. Stream bottoms and natural drainages are left in hard woods to generate food and cover. By increasing phosphorus through legumes, deer body weight and antler size have increased.

Altruism? No.

All of this comes at some cost to the company, so why do they bother to do it? Part of the reason is to improve public relations. But the companies also earn as much as $10 per acre in hunting leases. International Paper's 3,500-acre Cherokee Game Management Area in east Texas earns $6 per acre annually. In other states, leases average from 50 cents to $1 per acre, depending on the quality of the site. **Outdoor Life** editor Richard Starnes (1982, p. 11) concludes that

> in the future, timber companies will get involved with leasing lands to hunting clubs, which will then provide timber management of their own. This will give hunters an investment in wildlife helping companies manage their lands.

The number of hunting clubs interested in contracting for land is rapidly increasing. As **Fishing and Hunting News** reports,

> Today, as the ranks of hunters grow and the available public lands shrink, more and more savvy sportsmen are turning their attention to the hunting club. What's more, folks have discovered that these preserves are an affordable option to hanging up the gun at the end of the general season.

Clubs that support many different bird species can be found from coast to coast and from border to border. The contracts governing the use of private reserves vary with fees charged based on number of birds bagged, number of birds released in the fields, guide services, and annual membership fees.

> In these days of posted farmland, shrinking public access, and growing hordes of hunters, a hunting preserve membership is an absolute guarantee that you will have a place to hunt and a place to take junior, and you won't have to spend half of the day looking for a landowner whose permission to hunt may not come readily... The bottom line is better hunting, more shooting, and a happier end to each excursion. What more can the outdoor sportsman ask for?" (**Fishing and Hunting News**).

Clearly, some sportsmen are beginning to recognize that private contractual arrangements offer an alternative to the public provision of widlife.

The hunter and the landowner should be friends

This alternative is especially evident in Texas, where over 85 per cent of the land is privately owned. Deer hunters purchase leases to hunt on private land at fees that range from $100 to $2,000 per gun, depending on the quality of the hunting site, the quality and quantity of game, and the facilities and services provided by the landowner. The type of lease varies: 71 per cent are deer season leases, 19 per cent are year-around leases, 5 per cent are day leases, and 5 per cent are short-term leases. On a per-acre basis, lease rates range from 25 cents to $10 annually. Taylor, Beattie, and Livengood (1980, p. 2) concluded that "the net returns from deer leases equal or exceed the annual net returns from livestock operations in many areas of the state."

Hunter success on leased lands is extremely high relative to public sites. On leased lands, 1.16 deer were killed per hunter in 1978, while on public lands 0.62 deer were killed per hunter (Livengood 1979).

> The rancher-landowner is responsible for the wildlife on his place. When the hunter appears, the hunter is charged a fee to hunt on the land.... (T)he cowman participates because he makes money. By the same token, if that cowman posts his land "no hunting," it costs him money. You just don't see that many acres posted "no hunting" (Chambers).

Cooperation between sportsmen and landowners is improved as a result of market contracts that force individuals to take into account costs and benefits. While it is often "assumed that private property rights cannot be enforced in the case of fisheries, wildlife, and whatever other resources economists have chosen to call 'natural' " (Cheung 1973, p. 33), it would appear that such assumptions only generate more fables.

Private Land Conservation

Arguments abound in favour of government intervention for conservation in general and for land conservation in particular. They are based on excludability, and the divergence of private and social discount rates. "It is the clear duty of Government, which is the trustee for unborn generations as well as for its present citizens, to watch over, and if need be, by legislative enactment, to defend the exhaustible natural resources from rash and reckless exploitation" (A.C. Pigou, quoted in Milliman 1962, p. 199).

In the case of land, the call for government action is further buttressed by the claim that market information does not clearly reflect the future value of agricultural production. The National Agricultural Land Survey (NALS) purports to show that over 3 million acres of agricultural land in the United States are being converted annually to other uses. It has given conservationists the ammunition to press even further their demands for legislation designed to preserve agricultural lands (Baden, 1983). Since the late 1800s, the same arguments have been used to justify governmental ownership of one-third of America's land. Everything from national parks to wilderness areas to historic sites supposedly fits into the market failure category. On that basis, vast bureaucratic empires have been built.

Leaving aside the question of whether existing landowners will provide sufficient land preservation and whether the government can do any better (see Baden and Stroup 1981), let us examine the private options for land preservation.

> The economics of land conservation are currently undergoing some changes. In the past, much of the activity in land conservation centered on moving land from the private sector into governmental ownership and on classifying public lands into protected status (national parks, wilderness, and primative areas, monuments, etc.). In the present state of tightening public budgets, money for land acquisition is rapidly drying up and resource development of public land is receiving federal encouragement. Leaving the issue of struggle over public land management aside, the strategies of the land conservation movement are

> adapting accordingly as they look increasingly to the private sector for support and action (Rusmore 1982, p. 87).

The Nature Conservancy

Leading this adaptation on the national level has been The Nature Conservancy (1983, p. 3).,

> a national conservation organization committed to preserving natural diversity by finding and protecting areas that contain the best examples of all components of the natural world. Since 1950, the Conservancy and its members have been involved in the preservation of nearly 2 million acres in 50 states, the Virgina Islands, Canada and the Caribbean.

In 1982, the Conservancy held over $261 million in assets, nearly $190 million of which was in natural land areas. At the end of 1982, the Conservancy's portfolio included 689 preserves, a permanent capital fund of $49.5 million, and 3,098 land conservation projects encompassing over 1.9 million acres.

At the local level, land conservation organizations, using primarily volunteer initiative and private funds, have grown rapidly during the past three decades. In 1950, only 36 conservation organizations existed in the United States. By 1975 there were 173 and by 1982 there were 404 groups representing over 250,000 members. Local conservation organizations in 1982 controlled over 675,000 acres of valuable resource lands, with over 60 per cent of that total in the New England and Middle Atlantic states, where private ownership is dominant.

Land conservation trusts are generally established with tax exempt status. Their purpose is that of preserving land for its amenity values and for keeping land in agricultural uses. Funds are raised by soliciting members, with membership fees levied at a small amount per year, and by soliciting grants from foundations and corporations, sometimes amounting to hundreds of thousands of dollars. With these funds, the land trusts can purchase fee simple title to land or simply purchase conservation easements. In addition, trusts

find that, "given the moral inclination and encouraged by tax incentives, some...(private) owners are committing their properties to conservation purposes" (Rusmore 1982, p. 187).

Tax incentives

Tax incentives are very important to the land conservation organizations, since individuals can deduct their contributions as charitable donations. Individuals who give conservation easements to these organizations can also deduct the difference between the value of the land without the easement (the development value) and the value with the easement (the conservation value). These "bargain sales are one of the most effective levels the (Nature) Conservancy has to pry loose land it wants" (Wood 1978, p. 79). It might be aruged that conservation contracts between private organizations and existing landowners really are stimulated by government, since such contracts depend heavily on tax incentives. Taking the tax institutions as given, however, the "business-suited saviors of the nation's vanishing wilds" (Woods 1978) clearly represent a private response to the provision of amenity values.

Once lands are held by conservation organizations, they tend to manage them differently than public bureaucrats. Even land swapping is not uncommon. For example, when The Nature Conservancy decided that land it had been given in the Virgin Islands was not of prime environmental importance, it exchanged it for land in Wisconsin that could be managed as an integrated watershed for amenity purposes. While land conservation organizations undoubtedly suffer some of the problems faced by all non-profit organizations, there are some important elements of residual claimancy.

Land trusts are also not opposed to charging user fees to people who obtain benefits from their lands. Since these organizations cannot readily tap public funds, they are continually looking for innovative ways to finance projects. Speaking for the Trustees of Reservations in Massachusetts, Gordon Abbott Jr. (1982, p. 207) states that

> We're also fortunate that user demand enables us to raise 35 per cent of our operating income from admission fees and that these can be adjusted within reason to catch up with inflation. We're great believers in the fairness of users paying their way.

User fees

Fees are charged for everything from parking to concessions to entrance, demonstrating that excluding nonpayers from consuming amenity values is possible at a cost. As the amenity values rise, organizations are finding it worthwhile to undertake exclusion costs in an effort to raise funds. These organizations also have an incentive to charge fees because the revenues can be reinvested. This is in sharp contrast to the policies of the National Park Service, which has kept entrance fees in real terms below pre-1920 levels.

There is little doubt that "the private sector is proving to be a formidable ally" (Rusmore 1982, p. 187) for the conservation movement. As a leader from the New Jersey Conservation Foundation puts it, "We have entered an area when we now acknowledge that government cannot best solve all our problems and that solutions that draw on the private sector will offer greater economic efficiencies and flexibility" (Moore 1982, p. 213).

With the federal government cutting back on its land acquisition programs, people are turning more to the private sector for the provision of land generated amenities. Even though these organizations face an element of the free-rider problem, they have raised significant amounts of money and found ways to overcome the difficulties, at least partially. The groups are unlikely through outright purchase programs to accomplish what the government has done through its acquisition programs. "However, using the kinds of innovative land-saving techniques they have pioneered, local groups in partnership with government agencies can significantly contain the threatened damage to...critical areas" (Rusmore 1982, p. 219). Again, it is simply not the case that "protecting the citizen against such common environmental blights as filth, fume, stench, noise, visual distractions, etc. by a market and property rights are too remote to be taken seriously" (Mishan 1972, p. 62).

IV. CONCLUSIONS

When I first heard Professor Cheung (1970, p. 58) suggest that economists discard the concept (of externalities) entirely," I was convinced that he was simply playing a game of seman-

tics. More careful thought, however, has convinced me that he is correct.

> The change in view through the analysis of contracting is not a redundant way of treating the same class of problems, for this change in view leads to different...questions. Why do market contracts not exist for certain effects of actions? Because of the absence of exclusive rights, or because transaction costs are prohibitive? Why do exclusive rights not exist for certain actions? Because of legal institutions, or because policing costs are prohibitive?

There is certainly good evidence that the approach proposed by Pigou has not taken us very far toward an understanding of natural resource allocation. It has basically provided arguments for governmental intervention. The property rights transaction cost approach suggested by Cheung, on the other hand, is helping us identify the relevant margins for deciding on natural resource allocation. By looking at the actual market process--i.e., the contracting process--we often find that assumed external effects can be negated through contract. Further, when we ask why contracts do not take externalities into account, we are forced to examine all transaction costs, including governmental restrictions. The three natural resource uses examined in this paper reveal that contracting processes are working in some cases. In others, it appears that legal restrictions prevent contracting.

Contractarian Directions

The new institutional economics approach suggests two important directions for the study of natural resources. First, more attention must be paid to the nature of existing contracts. In the case of fee hunting, for example, many questions need to be asked about prices, product specification, length of contract, and provisions for exclusion. Only such an examination can expose the true transaction costs that determine which margins will be important to decision makers. Natural resource economists are only beginning to turn in this direction.

Second, natural resource economics must develop clearer ways of thinking about the free-rider problem. Environmental groups in general and land conservation organizations in particular seem to be overcoming the free-rider problem in a significant way. Again, I suspect, the nature of the contract is important. What economists assume to be free-rider situations may simply be more fables.

As Douglass North (1981, p. 47) suggests, "strong moral and ethical codes of a society is the cement of social stability which makes an economic system viable." The property rights/transaction costs approach draws our attention to the effect that this "cement" has on the contracting process. By focusing our attention on the nature of contracts and transaction costs, we will be able to develop a better understanding of the relationship between the market process and environmental amenities.

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RESOURCES AND OWNERSHIP: THE PUBLIC GOOD PROBLEM*

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* I have benefited from comments on this paper by Ernst Berndt, Anthony Scott, Robert Wright and Michael Walker.

CONTENTS

I. INTRODUCTION

Since the end of the Second World War, and especially over the past decade, the Canadian petroleum industry has been subjected to increasing government involvement. The current degree of government control is sufficiently pervasive as to suggest that petroleum, and possibly other resource industries, are activities that may best be publicly provided. In other words, is there something about resources that makes them tantamount to a public good?

Continental European writings on public expenditures have an extensive history of references to public goods, but in English-speaking countries until the 1950s or so the term remained foreign. However, during this period Paul Samuelson wrote several articles developing a theory of public expenditures based on the concept of public goods.[1]

What, as seen by Samuelson, is the distinction between public and private goods? He said:

> "I explicitly assume two categories of goods: ordinary private consumption goods...which can be parcelled out among different individuals...and collective consumption goods...which all enjoy in common in the sense that each individual's consumption of such a good leads to no subtraction from any other individual's consumption of that good..."[2]

This characterization leads to the view of goods as embracing a spectrum. One end is occupied by pure private goods, where consumption by one person necessarily leaves less for anyone else; the other end of the spectrum represents pure public goods, where use by one person does not in any way

curtail the amount others can consume. An implication is that the provision of public goods cannot be handled by a conventional market system. Popular examples of public goods range from the provision of national defence to the reception of TV programs.

Pure public goods are quite rare. But Samuelson's definition was set up mainly to provide a suitably stark analytical contrast between public and private goods. Certainly, if public goods were confined to such a strict definition this would be a very short paper indeed, since few if any activities relating to natural resources could qualify. Consumption of natural resources, especially of the non-renewable kind, almost always precludes consumption by others.

However, the pure public goods concept can be readily broadened to cover goods and services having public goods related characteristics. And it is in the context of these broader aspects that the public goods problem in relation to resources and ownership becomes relevant.

In Section II of this paper I look in more detail at certain characteristics of public goods. Sections III and IV examine the question of public goods in the natural resources industry with which I am most familiar -petroleum. Specifically, Section III relates to common property features of public goods in the context of petroleum reservoirs, while Section IV concerns the question of whether exploration possesses certain characteristics of a public good. Concluding remarks are made in Section V.

II. CHARACTERISTICS OF PUBLIC GOODS[3]

A broader view of public goods than Samuelson's gives rise to several related features: "joint supply," "externalities," "decreasing costs," and "common property."

Joint supply (or indivisibility) refers to the characteristic of a public good as being available to other individuals at no extra social cost once it has been provided to one individual. For example, a unit of Cruise missile deterrent, once available to individual A, is equally available to individual B.

The question of externalities, or side effects, is inherent in public goods since often they cannot be easily withheld

from those who do not pay--the "impossibility of exclusion" characteristic. And if it is not possible to exclude non-contributors, operation of a competitive market is emasculated. So one argument for the provision of public goods is where it is difficult or too costly to levy charges. However, the feasibility of charging depends mainly on technology. Reception of TV signals can be detected. Monitoring devices could be installed to record the passage of vehicles over all roads. But one's imagination is stretched to envisage services such as national defence being amenable to individual charges.

Conditions of decreasing costs associated with incremental use are often urged as grounds for public provision, or at the very least regulation, since on efficiency grounds it may not be feasible to employ conventional pricing to govern usage.

Common property aspects often arise in relation to natural resources where access conditions are not well defined by ownership.

Joint Supply

Jointness of supply implies that the provision of a good to one consumer facilitates its extension to all: the "indivisibility" or "lumpiness" characteristic of many commodities is viewed as related to public goods. But this requirement is quite stringent. Capacity limits are usually met well before a good has become equally available to everyone, as can be seen in the case of such apparent public goods as roads, bridges, police, flood control measures, vaccination programs and the like. Moreover, even if capacity constraints do not emerge, quality variations may occur. Crowded roads give inferior service compared with less congested routes. Nevertheless, jointness remains an essential characteristic of public goods, albeit in the more restricted sense that once produced, a public good is at least potentially available at low or zero incremental cost to other people.

Externalities

The classic description of externalities can be found in Pigou:

> "...one person A, in the course of rendering some service, for which payment is made, to a second person B, incidentally also renders services or disservices to other persons...of such a sort that payment cannot be exacted from the benefited parties or compensation enforced on behalf of the injured parties."[4]

This definition establishes unenforceability of compensation as the central criterion of an externality. The concept corresponds closely to the public goods criterion of "impossibility of exclusion:" private firms are unable to exclude other parties from participating in the benefits or costs associated with their production or consumption.

Externalities create divergencies between the value of private and social costs and benefits, which in turn can prevent private markets from achieving an efficient allocation of resources. However, if by various means externalities become accountable to firms (they become internalized), there is no reason why a competitive market could not operate.

Do public goods exhibit externalities? As we have seen, they may well imply impossibility of exclusion. While few goods completely satisfy this criterion, there are many which pose partial exclusion problems, thus exhibiting externalities.

Some of the best instances of goods with joint supply characteristics also pose the most difficult exclusion problems. Paramount examples are national defence, flood control and public health programs. But the conditions of joint supply need not preclude exclusion. For instance, train and tram fares can enforce exclusion, although to some degree joint public supply certainly exists. Thus, jointness of supply and externalities can be quite different properties of public goods.

There are differences in terms of enforcement between externalities and the exclusion problem of public goods. For an externality, incidental services need not be identical to the service for which payment is made. For example,

reforestation may not only increase the supply of timber for which buyers pay, but may also reduce erosion of surrounding farm land, a rather different service. However, in the case of a "pure" public good, the identical nature of the service provided is essential. Another difference is that in the case of an externality, the incidental service may extend to only some of a group, whereas with a "pure" public good the incidental service should extend to all persons in the relevant group.

What can be said in summary about externalities? The central definitional characteristic is unenforceability of compensation for costs or benefits. An externality creates a divergence between the marginal private and social products, whereas equality is usually required for allocative efficiency. In some cases, problems may be eliminated through mechanisms such as exchange or merger which effectively "internalize" the externalities. But in the absence of such action, the usual call is for some form of government intervention, including public provision.

Decreasing Costs

The indivisibility characteristic of jointness can be seen as a special case of the phenomenon of decreasing costs. Consider a pipeline enjoying, as would normally be the case, economies of scale: unit costs decline as pipeline size and throughput increase. Charges high enough to cover average cost may preclude capacity use of the pipeline, because some users willing to pay the marginal cost would not be willing to pay an average cost price.

But if the overall price were set to equal marginal cost, the pipeline would be a financial disaster. Employment of multiple pricing to charge customers willing to pay more than the incremental social cost could make the pipeline financially viable, but this would require strong price discrimination, possibly necessitating government or other coercive sanction. Other examples of decreasing costs are bridges, roads, canals, museums, ports, passenger trains and buses. Lighthouses must also not be forgotten--one of the earliest examples cited of public goods,[5] but also one which, as Coase has cautioned, is not a particularly good example of a service which only government can provide.[6]

The decreasing cost implication of Samuelson's public cost concept are evident from his definition, suggesting the cost of supplying more users at least up to certain capacity levels is declining or zero. Zero marginal cost can also suggest free provision--the ultimate subsidy.

The problem of the common

In the context of natural resources, questions of public provision and externalities often arise in the case of open access to facilities or goods, often known widely in the literature as the problem of the common. Examples include fishing from a body of water not owned by anyone, and hunting for or trapping animals on a common ground. The problem of the common also arises in the case of individuals drawing water from a common underground reservoir. If each land owner were allowed to extract as much water as he desired, without regard to any effects on the owners of neighbouring parcels, no protection would be afforded for a well owner from the lowering of the water table by his neighbour. Some of these features arise in the case of petroleum reservoirs, to which I now turn.

III. PUBLIC GOODS AND RESERVOIR OWNERSHIP

In Western Canada, with the exception of certain lands granted to private companies during the development of the country in the nineteenth century--for example to Canadian Pacific Railways and the Hudson's Bay Company-- property rights for sub-surface petroleum resources were reserved from surface rights by the proprietor, the provincial or federal governments. In this sense, any conflict between ownership and the public interest is seemingly solved. However, ownership rights are normally assigned for various periods to private interests by the award of permits, leases and the like. It is in this way that certain aspects of public goods can arise, especially for a fugacious resource such as petroleum in a reservoir.

Consider the enforcement of property rights in the case of owners of two oil wells in the same reservoir. It is easy to see the owners as enjoying title to the surface tract on which each drills, but the matter of owning the underlying oil is more complex. The volume of oil under a tract is not known with certainty. Moreover, some amounts can be drawn from

an adjoining tract without anyone being able to precisely measure it. The problem here does not so much lie in enforcing property rights, as in stating them. Legislation could stipulate that all oil under a given parcel of land belongs to the owner, but this is not a comforting approach since the amount of oil underlying an individual tract tends to elude measurement.

In the face of this problem, a doctrine of property rights for petroleum known as the "rule of capture" emerged in North America.[7] Under the rule of capture, "ownership" adheres not to the oil underneath a well but to the oil produced by the well. Consequently, if an oil reservoir were divided among several surface owners, incentives exist to drill wells and produce oil at high rates merely to establish ownership. In this way, a producer could drain oil from a neighbour's tract, while at the same time forestalling a neighbour who would drain his oil. Obviously this incentive for "beggar thy neighbour" could result in substantial economic costs not only through the drilling of wells merely to exercise ownership but because well production rates could be so high as to cause reservoir damage. And in fact this was exactly what happened in Texas in the 1930s, where the discovery of the huge East Texas field resulted in excessive well drilling and reservoir losses (not to mention steeply falling prices).

Market Demand Prorationing

The public policy response in Texas, which was also adopted in 1950 for the rather different land tenure system of Alberta, Canada was "market demand prorationing." Under this system, oil refiners are asked to "nominate" for oil they require at the prevailing price. All these nominations are added up and the required level of production is then allocated among wells by a quota scheme so that each well owner receives a "fair and equitable" share of production. In this way the problem of "lease line draining"--oil belonging to one producer draining into land leased by another--is overcome.

While the prorationing solution to the lease-line drainage "problem of the common" can be appropriate for a particular reservoir, it does not of itself necessitate going whole hog by regulating production among reservoirs. Yet this is what **market** demand prorationing accomplishes. Prorationing among, rather than just within, reservoirs is

usually justified in terms of avoiding price instability, given erratic additions to petroleum supply, and by extending the principle of producer's equity to include "the opportunity of obtaining his just and equitable share."[8] Thus, while prorationing systems was a response to problems caused by land tenure conventions, they have been expanded to serve other objectives.

An important issue is whether market demand prorationing, as a solution to the "problem of the common" in the context of oil reservoirs, has itself generated side effects or externalities.

Governments Intervene in the Market Process

During the period before 1973 Canadian oil prices were not directly set by governments. Prorationing contributed to price stabilization during this time by lending support to the existing price since competition between sources of supply within the prorated region--Alberta--was effectively emasculated. At the same time, the dynamics of market penetration were curtailed. Refiners could only nominate for oil by the prorationing procedure. They could not negotiate prices directly with producers. And demand generated by refiners had to be spread over all suppliers. Also, the revenue which integrated firms received from their prorationed production was not related to their needs as refiners. This reduced incentives to use more prorated crude vis a vis the use of owned production from areas not subject to prorationing.

Consequently, prorationing blunted price variations and the ability to respond to changing market conditions. If demand at the current price fell, supply was automatically curtailed. Excess supply would not find buyers at lower prices, because refiners could only request supply at the existing market price. These circumstances necessitated some degree of price leadership, since a mechanism was required to make price changes. This leadership was supplied by the major oil companies.

Another question raised by prorationing was how to mix the various crudes into streams that would match differing refinery requirements. The Alberta prorationing plan assigned production quotas by field and well, but the crude oil still had to be assembled into streams to suit refiners' needs. The whole process of taking the crude produced by all the wells in

Alberta and melding it into different batches acceptable to refiners was handled by the major integrated companies.

This participation by certain companies in making the prorationing system work has excited accusations in Canada that the Combines Act was being transgressed[9]--but that is another story.

Prorationing and Quotas Impact on Costs

The ability of the oil industry to compete was also affected by the way prorationing affected its cost structure. There were two aspects to this, one inherent in any prorationing system, the other dependent on the way quotas were set. With regard to the first, prorationing presumes the existence of spare capacity, so that price will not fall to clear the market. Thus excess capacity, which entails an extra cost burden, becomes normal rather than exceptional. The second aspect is that the Alberta prorationing system employed a formula which at least up to the mid-1960s had a marked effect on costs of production. Quotas were assigned according to the number of wells drilled and were calculated to guarantee recovery of well costs. This tended to stimulate well drilling and therefore led to higher costs of reservoir development. However, subsequent changes to the Alberta prorationing plan have encouraged more efficient operation.

Thus prorationing tended to foist a higher cost structure on the industry, and the degree of cost increase was significantly affected by the manner in which production quotas were set. The industry was less efficient as a result of prorationing. This made it more vulnerable to adversity and consequently more inclined to seek government action, as it did in the straitened circumstances of the latter half of the 1950s.

Since market demand prorationing has itself generated externalities as a solution to a certain type of public goods problem--another example of regulation not being costless -- what other solutions are available? One answer is some form of "unitization," where a reservoir is effectively treated as under the operation of one firm, a procedure which will eliminate the externality caused by the "rule of capture." While this is perhaps the ideal solution and one that appeals most to economists, technical problems in reconciling unitization with private property rights can make negotiated solutions difficult.[10]

IV. NATURAL RESOURCE EXPLORATION AS A PUBLIC GOOD

I now turn to the question of mineral exploration activity. The argument has been made quite often that governments should perform or contract for early exploratory work on public land, because information spillovers, scale economies and reluctance by explorers to take risks prevent markets from functioning properly.[11] In other words, public goods characteristics arise, suggesting a role for government.

In terms of information spillovers, if mineral deposits on one piece of land were related to deposits on another, exploration activities can yield information extending well beyond the land under exploration. The problem is to ensure capture of some of the spillover benefits by companies undertaking the activity--a familiar externality feature. A supposition is that since exploration companies cannot capture all the benefits derived from the mineral search, the market generates less exploratory activity than would be desirable.

The market can be further distorted by scale economies in the acquisition of exploratory information, where expensive equipment and expensive geophysical techniques are required. Such techniques have high fixed costs but low incremental costs for exploring additional areas. In this sense, exploration can be considered a decreasing cost industry which, the argument goes, makes it a candidate for government participation to distribute information efficiently.

Subsidies for "Basic" Exploration?

Mineral exploration is one of the more risky businesses, and if businessmen are risk averse, then the market could generate less exploration than is optimal, and government involvement could be socially desirable to spread risk. By performing the early geophysical work and drilling in virgin areas, the government could reduce risk by decreasing the size of the outlay required, while increasing the probability of success. Outlays would be smaller because exploratory work would have been performed and large tracts would not be required to capture information spillovers and scale economies.

In essence, the argument is that just as the government performs and subsidizes basic research, it should perform and

supervise early exploratory work on its own mineral properties. In this way it could prevent duplication of exploratory activities and take advantage of decreasing costs and to spread risk.

A fundamental tenet of the lower risk argument is that petroleum exploration firms are risk averse. But although firms may not have the risk-splitting capability of a government, large firms have many risk-bearing equity stockholders and do engage in substantial high risk ventures. Moreover, it is not clear that government-owned petroleum exploration companies--if they were the vehicle--would be less risk averse than private companies. After all, these companies are typically run by managers whose performance is subject to public scrutiny. This suggests government involvement may not generate a more generous attitude towards taking risks. Also the pooling of initial exploration activity by private firms in joint ventures offers an alternative vehicle for risk sharing.[12]

The spillover aspect, given a lack of market for information, is a classical case of externalities. One possibility is to make land tracts sufficiently large enough to reduce spillovers and any duplication of effort. However, if a government monopoly or a private firm chartered by the government undertook exploration, a reduction in the intensity of activity may not just represent avoidance of duplication. Geologists often mention the desirability of having several explorers investigate the same area, to avoid over reliance on one viewpoint. There is substantial evidence that exploration is best pursued on a wide open basis, benefitting from the enrichment of alternative approaches. It also seems that most of the value of exploratory information can be captured by exploration firms--in other words, markets for exploratory information are quite active.

Excessive Exploration?

Another feature is that competition among private firms for finite petroleum resources could lead to what is tantamount to excessive exploration of a "common property" resource. A prospective loss of control over virgin areas could encourage excess investment in exploration in a way analogous to over investment in reservoir drilling under the rule of capture discussed beforehand, whereas a public monopoly firm would

not be so motivated. To the extent this problem exists, the answer would appear to lie more in the nature of leasing arrangements than in conferring a public monopoly.

Several of these arguments reviewed above are directionally converse, because they suggest both over and under investment if exploration were pursued by private firms. Also, empirical analysis of the significance of alleged market failures has been almost completely absent. And it is not at all clear that at the "extensive" margin exploration is a decreasing cost industry. Hence the case for treating exploration, or especially initial exploration activity, as a quasi-public good is at best tenuous.

A more subtle aspect of government participation in risky activities such as exploration involves the role of the corporate income tax. Income tax in effect makes the government a partner in an investment project. And if the government does enjoy a greater ability to spread risk than the private investor, then government subsidization or participation could be justified.

For example, I was recently involved in evaluating the Arctic Pilot Project, a scheme to liquefy natural gas and transport it from the Canadian Arctic by specially constructed tankers to markets in North America or possibly Europe. Undoubtedly, this is a high risk undertaking. The expected after tax return to the project sponsors was estimated to be lower than that achieved by more mundane, lower risk investments in the Canadian manufacturing sector. In other words, the prospective returns in relation to the risks were not attractive. However, the corporate tax wedge component was about half the after tax return. This suggests that if the government saw itself as an implicit partner, it could forego some corporation tax and thereby perhaps make the project sufficiently attractive. This immediately raises the question of the appropriate opportunity cost of the public funds effectively invested in the project, a topic which goes beyond the scope of this paper. And this question relates more to efficient taxation than to the issue of public goods.

V. CONCLUDING REMARKS

Frequently cited criteria for the public provision of goods include conditions of joint supply, the "impossibility of exclusion," prevalence of "externalities," decreasing costs of

supply and access to common property resources. Distributional arguments have also been used, but are not discussed in this paper.

The most significant resource industry in Canada is petroleum. And the development of the Canadian petroleum industry since the end of the Second World War has been marked by a gradual but seemingly inexorable increase in government regulation and participation at both provincial and federal levels. This trend became particularly intense after 1970.

At present, government at various levels exert detailed control over most operations of the industry, including the key ones of pricing, output, marketing, imports and exports, and have erected a formidable battery of taxation instruments and subsidies. Almost all elements of oil and gas pricing from the wellhead to the final consumer are set by intergovernmental agreement (and ofttimes disagreement) or regulation. Licences are required to export oil and gas. Taxation measures vary from complex royalties levied by the provinces in their role as resource owners, to gross revenue and commodity taxes levied by the federal government. Moreover, discriminatory subsidies have emerged as a tool to promote Canadian ownership.

This degree of government involvement and control may well suggest to an observer that the petroleum industry must be supplying a commodity or service which can be characterized as a public good. One might think that externalities and decreasing costs must abound; that joint supply characteristics are prevalent.

However, such would not appear to be the case. Overall, while economies of scale can appear in certain activities, petroleum is an increasing cost industry. Consumers can be excluded and usage monitored by the price mechanism. Markets can and do work. Conditions of joint supply, except perhaps in refining, are unusual. Thus the reasons for government involvement must be sought elsewhere than in the concept of a public good. They may lie in concern about resource exhaustion (the fixed stock syndrome); in competing claims of governments to share in economic rents; and in the thirst to exert control with which many governments have become inebriated.

NOTES

1. For example, see Samuelson (1954).

2. Samuelson (1954, p. 387).

3. For discussion of several aspects of public goods, see Head (1974) and Atkinson and Stiglitz (1980).

4. Pigou (1932, p. 183).

5. See J.S. Mill (1909).

6. See R.H. Coase (1974).

7. I am reminded by Anthony Scott that the rule of capture stems from common law applying to wild animals. In England it also applied to underground water, a concept that migrated to North America; C. Ballem (1973, p. 4).

8. Quotation from "An Act to Provide for the Conservation of Oil and Gas Resources of the Province of Alberta," Statutes of the Province of Alberta, Edmonton, 1950.

9. See R.J. Bertrand (1981).

10. These problems are also discussed in Crommelin, Pearse, and Scott (1978).

11. For these kinds of arguments, see Petersen (1976); for some general discussion, see Uhler (1977).

12. Also see Scott (1976, pp. 15-17) for discussion of risk in the context of government resource revenues.

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