PROPERTY RIGHTS AND THE PATHOLOGY OF EXTERNALITIES

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NUMBER 24

WARWICK ECONOMIC RESEARCH PAPERS

DEPARTMENT OF ECONOMICS

UNIVERSITY OF WARWICK
COVENTRY

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NUMBER 24

May, 1972

I. INTRODUCTION

In partial equilibrium analysis, the concept of externalities, or what are called divergencies between costs and rewards as perceived by decision-makers and total costs and rewards produced by their actions, provide a standard exception to optimality conditions with perfect competition. They constitute a failure of the market mechanism to ration resources to their most highly valued uses. Prior to World War II, the neo-classical concepts of the problem, as formulated by Marshall and Pigou, provided the basis of a discussion which consisted largely of clarifying the nature of the long-run supply curve for a competitive industry. Following the War, and specifically in the last ten years, discussion of the topic has centred around the apparent "interdependencies" aspect.

Recently, there has been a proliferation of papers attempting to discuss the nature and definitions of externalities as well as the closely related topic of public or collective goods. Despite this, much ambiguity and confusion remains. For every "general" definition, someone comes up with a counter-example. Indeed much of the problem lies in attempting derivations of general properties by using particular examples, for the set of chosen examples will have a paramount influence on the influences drawn. That is to say, different sets will give different "general" properties. Unlike rigorous empirical analysis, the selection from the population examined is hardly random. It has been difficult then, to come up with general properties that are not so general as to loose their discriminating analytical power they were designed originally to have.

This paper will attempt to clarify the definition of externalities by using the concept of property rights which has also found its way into Economics recently. In so doing, the basic cause, indeed the economic problem

behind, externalities will be explored. Policy prescriptions will not be explicitly treated, but in general one would expect that policies formulated in the light of the cause of a malallocation of resources would differ from, and be superior to, those formulated in the light of the symptom of a mal-allocation.

In the following section we shall explore the interface between law and economics via the concept of property rights. In the third section we consider externalities as viewed in the light of this concept and a definition is offered.

II. THE ELEMENTS OF PROPERTY RIGHTS

The relationship between property and economic analysis has been increasingly explored in the Economics literature in recent years. This paper will review the developments that have occurred and examine their relationship to the externalities problem. The work of Alchian {1961}, {1965}, {1969}, Demsetz {1964}, {1966}, {1967} and more recently Cheung {1969}, {1970} and Pejovich {1969}, provide the basis of this section. In broadest terms, property rights analysis can be used in positive economic analysis to ascertain why certain economic activities are organized through various institutional arrangements - e.g. governments, firms, courts - rather than through the "market" or price mechanism. Alternatively, predictions regarding the implications of switching a particular economic activity's organization from one institution to another can be made. This paper will not give an exhaustive treatment of property rights analysis but rather outline the elements necessary for a discussion of their relevance to the externality "problem".

a. Property Rights

Peoples' often unlimited desire for the control of a finite amount of resources leads in every society to the "scarcity" of resources and the consequent problem of allocating these resources among competing claimants. The institution of property (to be rigorously defined below), is a direct response to scarcity. The method of resolving the conflicts of interests among utility maximizing individuals may be viewed as the process of assigning to particular individuals the "authority" to select for specific goods, any use from a non-prohibited set of uses. This we shall call a system of property rights.

A property right is the authorisation "to do" a certain activity or to the use of resources in a specified set of ways. If I am authorised to fish in a certain stream or live in a certain house, I have the property rights to the fishing activities in the stream and living activities in that house respectively. Similarly, I have the property rights to the car which I purchased and to which I hold the title, which is to say that I am authorised to drive the car, paint it, sell it, throw rocks at it, or leave it in the driveway, to mention a few of the authorised uses (property rights).

Alternatively, a set of property rights involves the prohibition of a certain set of activities or uses. Thus, my property rights to my car do not include the right to smash it into your car. (Why this may be so will be treated in the next section, for now we are merely defining terms). Property rights are rarely absolute in the sense that one is able to do "everything". There are always some prohibitions (we will see why later) that the system imposes. Zoning regulations, licences, social customs, leases, religious

taboos, codes of ethics and contracts are all examples of limited property rights. Property rights may then also be viewed as constraints on the uses of "property". Of course, even with unlimited property rights, there are certain activities which could not be performed. For example, one could not "drive" to France from England right now because that is physically impossible; property rights are authorities of one person against another person, not against "nature".

Ultimately the possession of property is the possession of power, the power to affect the availability and nature of particular goods and services. Property rights are relationships, not between persons and things, but between people because it provides one person the power to exclude others from the present, and perhaps future, use of resources. Weissman goes so far as to explicitely define property as power:

> The extent of property is measured not by grasp, or physical possession, or use, but by power, acknowledged and supported by the state to keep others from access to resources they might otherwise enjoy. In short, what may at first glance appear to be dominium over things is more accurately perceived as imperium over fellow human beings.(*)

Now within any society,(**) individual's property rights do not exist independent of the society. That is to say, there are no God-given, natural or "inalienable" rights possessed by individuals. Property rights are created within a society precisely because of the society and the (inevitable) conflicts that ensue. They are created by men, who may quite often invoke divine support

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(*) Weissman,{1964}, p.50.

(**) A society will be construed as a set of individuals.

and must be enforced in some way, even from fear of the "Almighty". Property rights in any society may be seen as supported by the force of social custom, etiquette, ostracism, and/or legally enacted laws supported by the state's police power of violence or punishment as well as the private physical power of an individual.

Precisely because of the variety of enforcement modes available, (and the costs of using these, to be discussed later), we may observe a discrepancy between de facto and de jure rights. De facto rights may be seen as supported by an owner's private ability to exclude non-owners in addition to, or in spite of, a law specifying a different amount of rights, de jure.

Some or all of the forces referred to above may bear upon a particular property right. Thus, if you make what I consider an excessive amount of noise, I may complain to you and your embarrassment (sensitivity to social custom) may preclude your continuing the noise making. However, if you persist in making noise, I may call the police who will enforce the "law" relative to noise. If you still persist, you may go to jail. In the broadest sense, many social customs can be considered as specifying property rights to certain forms of behaviour (languages, clothes styles, etiquette, inter-personal relations) which may or may not be enforced by the state. De facto "laws" may then exist independent of legislative laws and are often those which affect social customs. We are not normally concerned with these social laws in Economics. What prohibitions "should" be enforced by the state and what should be left up to social pressures is constantly under adjustment and often the source of heated debate. The current controversy over "legalised" (or non-illegal) abortion and marijuana smoking are obvious examples.

The method by which individuals receive or may transfer particular

property rights defines the system of property rights. In Economics we are normally concerned with private property exchange, although the field of "Public Finance", and what is now being termed "Public Economics" is interested in other methods. Examples of other systems for transferring property rights include first come - first served, beauty first, third party allocation (courts, government), random choice (lotteries). All of these are systems which employ different discriminating criteria in the arrangement of property rights. The allocation of resources will differ as the system differs, not only because of the allocation rules, but also because of the costs of utilizing each system.

b. Ownership

We have not as yet defined ownership. We may define an "owner" to mean the person or persons who has the power or ability to choose uses of what he is said to own. This power, as previously mentioned, may be supported by the state, social pressures, or the owner's own ability to physically achieve dominium.(*) Ownership of a certain set of property rights may involve consequences for non-owners. As long as these consequences are included in the set of defined property rights, then the affected non-owners have no "right" to object, if those consequences are deemed bad.(**) The property rights may in some instances involve severe limitations on non-owner or "spill-over" effects. In other cases, these effects may be more permitted. The definitions

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(*) The method of exclusion is often not without legal constraints; that is, the private property rights one has in a particular resource may not include the right to protect that right with certain methods. For example the right to kill or maim in the protection of a property interest by using spring guns, etc. is limited. c.f. Richard Posner, "Killing or Wounding to Protect a Property Interest", Journal of Law and Economics, April, 1971

(**) However, there may be no restriction on their bribing the owner to cease the offensive activity. That is, the non-owners may buy the right from the owner regarding the activity in question.

of the set of non-permitted uses is merely the complement of the set of permitted uses. Whether we call those people "owners" who may determine the range of the sanctioned set of choices or who are protected from certain consequences, or whether we call the "owners" those who are allowed to make the particular choices from the sanctioned set of uses in an arbitrary decision. In everyday legal language the latter definition seems to hold. "Non-owners" are protected in certain rights just as owners are protected in the complementary rights. If I am prohibited from a certain set of uses to my "property" because the consequences of those uses affect your utility and the law in this instance protects your "rights", then you, through the law, are able to exercise control over my decisions as to what uses I will make of the property I "own". So who shall we call the owner? You? Me? The rest of society? To the extent that we are all affected by each other's actions and that the state (or social customs and presures) protects us from some of these consequences, we are all "owners" in some sense or other.

But the important question is not <u>whose</u> rights are paramount, but rather <u>what</u> rights does each person have with respect to the uses of certain goods. From the point of view of the individual, there are owner and non-owner rights. Looking at a group of people, there are only owner rights if everything is owned. My right to use what I own, but not to physically damage your goods, means that you have property rights in your goods (which include the right to their being physically changes - or damaged - only by you). Property rights in my goods in effect are expressions of rights to some uses of the goods you own. As I expand my property rights (in a world of finite goods and finite uses of those goods), your rights will diminish. For example, granting me the right to burn leaves may imply diminishing your right to breathe fresh air and expanding my right to foul the air. This is true though, only if everything of relevance or interest or value is owned, and if

the laws of property work smoothly.

The allocation of a particular use right associated with some resources to an individual may result from some private transaction through some legal proceeding, as in the case of nuisances. But even "out of court" agreements will usually involve contracts, written or oral, which are supported in some fashion by the law. In general, the "economic capability inherent in the right to use property depends upon what use courts will find unreasonably hurt another in the ordinary use and enjoyment of his property."(*) Economists may find such legal language vague: what does "reasonable" mean? However, the court's definitions of reasonableness and legality depend ultimately upon "the social utilities of the conflicting uses, the general character of use in the area, and the alternatives available to the parties."(**) In other words, the courts perform ad hoc cost-benefit analyses where the decision criteria may include considerations not normally included by economists. The actual weights assigned to various factors differ from time to time and place to place. While such a system for the resolution of conflicts of interests over the use of economic resources may seem less than ideal for the economist, the actual (indeed, the theoretical) application of welfare criteria to real world problems must also be judged imperfect.

c. The Elements of Private and Common Property

The institution of private property has two elements which form the basis of exercising property rights: exclusion and transferability. Exclusion by the "owner" (as legally defined or de facto recognised) of competing users

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(*) Weissman,{1964}, p.55.

(**) Ibid.

of a resource with respect to some activity associated with that resource, enables the potential benefits derived from a resource to be enjoyed by the owner. As such, exclusion creates the potential for gains from trade.

This holds whether the activity in question is a "good" or a "bad". If a "good", exclusion of one person's enjoyment of a scarce activity means more for another. If a "bad", exclusion of one person still means more for another, but who becomes better off (in the absence of trade) may be reversed from the case of a good.

It is also important to recognise that we are speaking of activities associated with, or characteristics of, a good (or bad). That is to say, we are viewing a resource as a composit of a set of possible activities or characteristics.

The second element of private property rights is the ability to transfer the (potential) benefits derived from a resource to other individuals. Transferability, then, permits the realization of gains from trade.

Now neither exclusion nor transferability can be had at zero costs. Information, policing, organisation and realignment activities must be performed in order that the two elements of private property rights are realised. To the extent that these activities cost something, they will tend to only be performed to the point where marginal gains and losses are equal. Hence, positive costs of exercising property rights will reduce the value of the property rights one owns. Alternatively, any reduction in these costs will increase one's effective property rights and hence the value of such rights.

When restrictions on exclusion and transferability are severe

the resource may qualify as common property. Common property is distinguished by the characteristic that a number of individuals have an unrestricted right to all or some specific part of the benefits of a resource. Moreover, in contrast with private property, common property is not directly transferable.

d. "Freedom of Choice"

Another aspect regards the reciprocal nature of the assignment of property rights. In principle the property rights of owners could be defined so severely that they would not have the right to impose any consequences - (to be discussed below) on other parties as a result of their activities. Such a severe restriction would necessarily reduce the range of choices open to the owner; "personal freedom" or "freedom of action" would be quite limited. One might think, then, that the other extreme case, that of no restrictions on each person's uses of their property, would lead to a maximum of freedom of action. But if the rights were so defined, then an owner could make choices that imposeded considerable consequences on other people, and other people would be doing the same thing. The actual or effective range of activities open to each person would be reduced, not so much by the property laws as by the consequences of other peoples' activities that most likely would be undesirable. In either extreme, freedom of action would be severaly limited. Whether one extreme would be less restrictive than the other is an unanswerable question. But what does seem clear is that a movement towards either extreme will constitute a reduction in freedom.

The implication here is that the particular extreme that any society's laws (social or legal) tend to fall near cannot be non-normatively judged. The first extreme is somewhat akin to a dictatorship or paternalistic state. As such, laissezfaire advocates point out that "excessive" government

regulation of property laws involves an invasion of privacy and of individual rights to "free choice". But the laissezfaire position, which is closer to the other extreme, can not in effect guarantee any more "freedom". The second extreme is akin to anarchy. Choices will be limited not by laws but by other people's actions and the consequences of those actions. The question, again, is not whether one system can be objectively compared to the other vis à vis freedom or coercion. The question is what system of enforcing and allocating property rights is desired. In addition, the implications of a given system of property rights will differ among members of a society; that is, the distribution of income is not unaffected by changes in legal liabilities. The issue of what kinds of laws are allowable is a normative one, the answer to which will no doubt depend upon the effects of alternative structures of property rights on those who have the political power to make and enforce the laws: those effects being economic, cultural, moral and personality consequences.

e. Types of Consequences, "Blame" and the Law

As argued above, the consequences of a person's activities for another form the basis of the establishment of property rights. The types of consequences are varied, however, and the law's protection of individual rights is often not consistent between different consequences which have the same effects on welfare. Following Alchian, we may identify three broad categories of consequences: informational, physical and value.(*) While this paper is not the appropriate place to investigate rigorously the law's treatment of these consequences, a few general comments may suffice.

(*) Alchian, {1961}, These classifications are not unambiguous nor are they mutually exclusive, they are useful here because of their treatment in the law.

In the absence of clearly defined property rights,(*) the question of who "causes" a "spill-over" effect, or "who is to blame", involves an arbitrary or unanswerable judgement. If I must pay (am liable - or "to blame") for any costs - that I impose on you, your being there to complain and collect compensation inflicts harm (to the extent that I may pay) on me. If I didn't have to pay (i.e. if I owned the rights to engage in the harmful activity), you would bear the losses with no compensation. But who is to blame? If you were there first and I came along and created a nuisance for you, you (and probably the courts) would blame me.(**) But if I had been engaging in the (to you) offensive activity for years and then you came along, settled next door and demanded payment for losses rendered,(***) your coming along would inflict a cost on me.

But it is precisely one of the functions of laws and social customs, etc., to define the set of authorised uses or set of unauthorised uses. In this way, "blame" may be affixed and the resolution of conflicts of interest may take place.

Informational costs and benefits often involve no victims, or at least no human victims; one's utility may be affected simply by the knowledge that another person is engaging in an activity. For example, experimenting

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(*) This phrase is not as vague as it may sound. By clear definition we mean that there is no ambiguity regarding the issue of whether a certain use (or consequence thereof) is contained in the set of allowable activities. That is, we can answer clearly "yes" or "no" questions regarding certain uses of the given property.

(**) For a thorough explication of this and the entire reciprocal nature of the costs of externalities, see Coase, "The Problem of Social Cost", Journal of Law and Economics, (Oct., 1960); to be discussed later.

(***) You would only do this if the value you paid for the land, as judged by you did not account for this "extra" cost.

on cats and dogs, homosexual behaviour, consumption of pornographic material and smoking marijuana are activities which, if secretly engaged in, provoke no objections. Those who feel worse off do so only because of the knowledge that the activity is or has occurred. Laws regarding such informational effects are often instituted by the state and economic resources are used to enforce them even though the wealth position of the "victims" may be unaffected.

Physical effect costs and benefits are the most commonly referred to and usually the type considered in discussions of externalities. The treatment of these in the law is a complex subject which usually falls under the law of tort. The determination of "who is to blame" (and hence is liable for any damages) in such cases is often made on the basis of arbitrary rules and notionsof distributive "justice" and only more rarely in consideration of the law's effects on allocative efficiency.(*)

Value or pecuniary costs and benefits are rarely protected against by laws. A common example involves the loss of the value of an enterprise due to the introduction of a new competitor. Similarly, the relative "beauty" of neighbouring property which is allowed to decay may affect the resale value of a lot so that the owner may be as worse off as if he had suffered some physical damage to his property (equal in value to the fall in the value of his property) for which he is not compensated. Recently, the law has begun to consider compensation in such cases, for example, the effects of noise on property values.

(*) Since determination of liability is often ethically arbitrary and, in some cases, theoretically neutral vis à vis the allocation of resources we can rarely discriminate objectively between various laws. For an excellent discussion of the economic effects of some tort cases see the classic paper by Coase {1960}.

f. Exchange Value and Property Rights

The exchange value of any good will reflect the set of authorised uses that are specified in the property rights. In general the more rights (uses) one gets with a given resource, ceteris paribus, the higher price one is willing to pay. That is to say, in one sense the "quality" of the good, as measured by the size of the specified set of legal uses, increases with that set. Uncertainty regarding the de jure or de facto extent of one's rights will reduce the expected size of the set and hence reduce the exchange values. Thus, the price one is willing to pay for a car which will be parked on a crime ridden street will be lower than one which is parked in a "safe" neighbourhood.

The "market value"(*) of rights associated with common property is low, if not zero. This is due to uncertainty attached to future benefits because of the high policing costs involved and also because the costs of transferring such rights are usually high. For example, one's right to use a community swimming pool may only be transferable by physically moving out of the community, the "market value" will be low also because, as a result of the above mentioned factors, the property will be inefficiently used (e.g. individual investments in improvements or in waiting to exploit the resource will not be made).(**)

III. EXTERNALITIES

In discussing externalities, we shall use as a "straw model", the often quoted paper by Buchanan and Stubblebine {1962} who attempted to offer

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(*) "Market value" refers to the identifiable price people are actually willing to make. In many cases the asset in question may not be amenable to allocation through the market for the reasons under consideration.

(**) There is undoubtedly some simultaneity between a low "market" price and inefficient use.

a rigorous and precise definition in mathematical terms. While various aspects of their paper have been subject to criticism, the basic features still describe the post-war comtemporary wisdom on the subject. See for example, Mishan's recent paper {1971}.

There may be some confusion as to whether in defining an externality we are attempting to isolate particular characteristics of goods, bads or activities which then have implications for an equilibrium allocation of resources or whether we are attempting to isolate particular equilibrium conditions which differ from those normally predicted and observed. Most papers in this area use the first approach, although in thinking about the subject it is often easier to "work backward" and adopt the second. In the description of the concept of externality argued for in this paper, the later approach is more appropriate because, as we will see, there is nothing "inevitable" or inherent in a good or activity which will make it necessarily an externality.

a. Standard Concepts

According to Buchanan and Stubblebine, an externality is present when

(1) $U^A = U^A (X_1 ; Y_1)$

where X_1 is a vector of activities controlled by individual A and Y_1 is a vector of activities controlled by individual B.(*) Thus the utility of individual A is a function not only of his own activities, X_1, but also of B's activities Y_1. An activity here is is "any distinguishable human action that may be measured, such as eating bread, drinking milk, spewing smoke into the air,

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(*) Buchanan and Stubblebine {1962}. The word "firms" may be substituted for "individual" and "production functions" for "utility functions" without modifying the analysis.

dumping litter on the highways, giving to the poor etc."(*) More generally the model may be extended so that A's utility may be a function of other individuals:

$$(2) \qquad U^A = U^A (X_1 : Y_1, Y_2, \ldots Y_n) .$$

A then chooses the elements of X_1 so as to maximise his utility subject to the externally determined values of the elements of the Y vectors.

A "marginal externality" is said to exist if any,

$$(3) \qquad U^A_{y_{ij}} \neq 0$$

and will be "potentially relevant" if (3) holds at any particular numerical value of y_{ij}:

$$(4) \qquad U^A_{y_{ij}} \Big| _{\bar{y}_{ij}} \neq 0 .$$

That is to say, whether or not A's utility is affected by B's activities depends not onlyupon the nature of those activities - i.e. qualitative aspects of any y_{ij} - but also upon the extent of that activity (numerical value of y_{ij}). If you mow your lawn at 6 a.m., I might not "care" (my utility remains constant) if you happen to use a silent mower. But if you use a noisy one (increase the activity of making noise), my utility will decrease, and I will prefer that you either get a less noisy lawn mower or mow at a different time. (In this case, y_{ij}, is noise in the early morning emanating from your house).

However for allocative significance it is not sufficient to look just at the margin to see if total welfare can be improved. It may be that while (4) does not hold, A could still gain if y_{ij} were changed by a discrete amount, giving an "infra-marginal" externality:

(*) Ibid. p. 478.

$$(5) \qquad U^A_{y_{ij}} \Big|_{\bar{y}_{ij}} = 0 \quad \text{and} \quad \int_0^{\bar{y}_{ij}} d_{y_{ij}} \gtrless 0$$

So even while such a case is irrelevant at the margin, A is motivated to try and induce discrete changes in y_{ij} unless, given the values of all other elements in the n + 1 vectors, he is at an absolute maximum of utility with respect to changes in y_{ij}. In this case the infra-marginal externality is irrelevant:

$$(6) \qquad U^A_{y_{ij}} \Big|_{\bar{y}_{ij}} = 0 \quad \text{and} \quad U^A(\bar{X}_1 ; \bar{Y}_1, \bar{Y}_2, \ldots, \bar{Y}_n) \Big|_{\bar{y}_{ij}} > U^A(\bar{X}_1 ; \bar{Y}_1, \bar{Y}_2, \ldots, \bar{Y}_n)$$

for all $y_{ij} \neq \bar{y}_{ij}$. For example, below a certain noise level of your lawn mower (consider the activity of lowering noise as positive). I will be able to sleep on Sunday morning so that any further reductions by you are irrelevant from my stand point.

The existence of A's desire that B change the level of activity does not necessarily imply the ability to implement that desire. Institutional, legal or technical constraints may make the gains to A in achieving the desire less than the costs of doing so. But when A <u>can</u> be made better off without the acting party (B) being made worse off the externality is called "Pareto-relevant".

In other words, if A can bribe B to change the level of the privately chosen y_{ij} and B accepts they both stand to gain. Pareto-relevance is defined by:

$$(7) \qquad \frac{U^A_{y_{ij}}}{U^A_{X_k}} \gtrless \left(\frac{U^B_{y_{ij}}}{U^B} - \frac{P_{y_{ij}}}{P_{y_k}} \right) \quad \text{and} \quad \frac{U^A_{y_{ij}}}{U^A_{X_k}} \lesseqgtr 0 \quad \text{for} \quad \bar{y}_{ij}$$

and X_k, Y_k are the numeraire commodity available at the same price to each A and B

and $P_{y_{ij}}$, P_{y_k} are the price of y_{ij} and y_k respectively.

The point is simply that gains from trade exist between A and B. Condition (7) tells us that A's marginal rate of substitution of y_{ij} for y_k (the numeraire) is greater than B's "net" marginal rate of substitution between y_{ij} and y_k (the numeraire). If there is no room for gains from trade, then the marginal rates of substitution are equal and the condition may be termed one of Pareto equilibrium when an equality in (7) exists. Notice from (7) that while Pareto-relevant externalities vanish, the possibility of marginal externalities existing in Pareto equilibrium, as defined, exists. For example, if the activity in question may be undertaken at no costs, (i.e. the second term on the right hand side of (7) vanishes), equilibrium is attained when the marginal rates of substitution are "offsetting" - i.e. "their interests are strictly opposed".

Now these concepts, which providing the basis for a formal definition of externalities, are often ambiguous. At the outset "interrelationships" is equated with externality in (1). In a world of more than one individual and finite resources, interrelationships of this kind will emerge almost tautologically.(*) An externality arises because (a) an activity of one party has consequences for another and (b) this is not taken account of by the (offending) party in choosing his equilibrium consumption bundle because (c) he does not find it profitable (or preferable) to do so. This last point is important. If the parties can and do get together and bargain over the final value of the y_{ij} which is to be acceptable to both parties, given compensation (i.e. they trade property rights to the y_{ij} in question), then such bargaining will stop at a Pareto equilibrium. This point was made by

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(*) Mishan has pointed this out in, Mishan {1971}.

Coase {1960} when he showed that such "interrelationships" were not sufficient conditions for gains from trade to exist. To be fair, the conditions in (7) of Buchanan and Stubblebine are consistent with this last point, but the naming of (1) as an externality seems unfortunate.

Several of the terms introduced by Buchanan and Stubblebine are necessary but not sufficient conditions for an externality. The existence of a marginal externality (3) and the application of this to specific values of y_{ij} in the case of potentially relevant externalities (4) say nothing more than that A is not satiated with y_{ij}, ceteris paribus. Indeed, similar expressions for B will most likely obtain <u>at</u> his private equilibirum.(*) Condition (4) is an expression of the necessary condition that an activity of B's affects the utility position of A. Thus, the existence of marginal externalities in Pareto equilibrium is not surprising for it merely says that A is not satiated with y_{ij} (which is probably also true for B) since he (A) pays nothing for y_{ij}. And that the two parties' marginal rates of substitution between y_{ij} and the numeraire good at the equilibrium are unequal is merely consistent with their having different preference functions in the equilibrium range of y_{ij}.

The verbal description of "potentially" relevant is also ambiguous. Recall that "An externality is defined as <u>potentially relevant</u> when the activity, to the extent that it is actually performed, generates <u>any</u> desire on the part of the externally benefited (damaged) party (A) to modify the behaviour of the party empowered to take action (B) through trade, persuasion..." If, the term "desire" means simply that A would like B to change the equilibrium value of the activity which B has reached privately, then the term "desire"

(*) Nath {1969} pp 70-71, has made this point.

is analogous to the mathematical expression for marginal utility different from zero, (3). In this case, such a desire will not be abated until (6) is obtained and the definition is subject to the criticisms already put forth. But if we are to interpret the word "desire" in the light of the second part of this sentence where A must somehow convince B to change the equilibrium, then the problem for A is one of a constrained optimum where the constraint is imposed by the cost of inducing B to change his equilibrium position and by A's budget. It would not be proper to speak of a desire on the part of A to bring about a change in B's private equilibrium unless that "desire" already takes account of the costs which would be incurred by A of affecting that change. That is to say, if taking account of such costs, A's net marginal evaluation of the change is greater than zero, then the word desire is meaningful in this context.(*) In this interpretation, the definition of potentially relevant becomes similar to Pareto relevant, provided the marginal evaluations in (7) are also interpreted as "net" of adjustment costs. If they are not then it is difficult to interpret (7) as representing a situation when a Pareto improvement can be affected.

b. Property Rights Aspects

We may now discuss the relationship between externalities and property rights. We begin by possing two pertinent questions:

(a) Under what conditions would "Pareto relevant" externalities exist and persist? But more fundamentally,

(b) Under what conditions would the original specification of the model as given by (1) exist? The answer to both of these questions can be found in the existence of constraints which prevent a certain activity from qualifying

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(*) The desire for a change does not, of course, have to eminate from the affected party. B may note A's displeasure and offer to change y_{ij} for a price. When potential gains from trade exist, the perpretrator of the negotiations can be either or both of the parties involved.

as private property as discussed in the previous chapter.

When legal or technological constraints exist regarding transferability then gains from trade may not be reliable. Thus, if (7) is interpreted as not including these adjustment costs, the inequality of A's marginal rate of substitution and B's "net" marginal rate may not necessarily signal gains from trade. Indeed, if transactions and adjustment costs are added to (7), it may turn out to be a Pareto equilibrium, i.e. A is as well off as he can be given the constraints of his situation. Of course the inclusion of transactions costs in the calculus may still leave room for Pareto improvements in which case trading could take place until the properly defined marginal rates of substitution were equated. However, the nature and magnitude of the trading constraints we are referring to to here are not just those ordinarily thought of, if they were there would be no reason to use them as a distinguishing feature of externalities. The constraints we refer to are so binding as to disqualify (on one count) the resource in question as private property. For example, in Meade's famous Bee-apple externality,(*) the trading of rights would be impracticable without properly measuring the relevant amounts of pollen, etc. This would require the relatively expnessive development of the science of the "interactions" taking place. The presence of such constraints, however is not sufficient for the existence of an externality. We must also have another element.

The second and crucial set of constraints which lie behind the cause of externalities are those regarding exclusion. The trading of a resource or the property rights to that resource may not lead to gains because the potential of realising gains from trade does not exist if exclusion will

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(*) Meade {1952}.

not take place. It is for this reason that A can consume y_{ij} at no cost, and why it enters hus utility function at his private equilibrium and in (7). Because there are costs to B of excluding A, it may not pay B to exclude. Similarly and particularly in cases where A consumes a "bad" (y_{ij} is a diseconomy) the cost of A opting out of consumption (i.e. "self-exclusion") may be greater than the benefits derived from opting out.

This difference between exclusion and "self-exclusion" above is illuminating and has recently been made by James {1971} who distinguishes "non-exclusive" and "non-optional"goods and bads. If a good Y is produced (or used) in such a way that no consumer, if he wishes, can be prevented from consuming the good, it is a non-exclusive good. However, the decision to consume is a private one made by the consumer and will depend upon the costs of consuming, e.g. transport, information and user-time costs etc. That is, the non-exclusive good is "there for the taking". If these costs of consuming are very high, then despite the good's availability, no one will choose to consume Y (except perhaps the"owner") so the effect is as if it were not produced or used in an available state, i.e. is private property. If, on the other hand, these costs of consuming are very low, then consumers may choose some Y according to their own utility functions and budget constraints. Alternatively this last case may be viewed as one where the costs of opting out of consumption of the good, or escaping in the case of a bad, are very high. Moreover any attempt to alter upward or downward the amount provided will involve a cost and may not be worthwhile. This last case is what James has termed a "non-optional"good (or bad). We may add the following observations.

For goods, non-exclusiveness is a necessary, but not sufficient condition for non-optionality. It is necessary because if the good were not available to the consumer (A) except at some cost imposed by the provider (B),

it could not logically qualify as non-optional. That non-exclusiveness is not sufficient for non-optionalityfollows from the fact that the costs of not consuming impose additional constraints on the problem and there is no reason a priori to expect these to be significant in all cases. So the set of non-optional goods is a subset of the set of non-exclusive goods.

Similarly for bads, non-exclusiveness is a necessary but not sufficient condition for non-optionality. Since people will voluntarily incur costs to reduce their levels of consumption of a bad, private entrepreneurs may blackmail people by providing otherwise.exclusive goods on a non-exclusive basis in the expectation of receiving bribes to withdraw the good. Since it then costs the consumer to escape, the good is by definition non-optional However, the costs of opting out, roughly the minimum the producer (B) is willing to accept from A to withdraw the non-exclusive bad, may exceed the maximum which the consumer (A) is willing to pay to escape so that the bad is then non-exclusive and optional.(*) In the event that the producer has incurred greater costs in providing the bad on a non-exclusive then on an exclusive basis (in anticipation of blackmail receipts) this last case will result in the bad being withdrawn from non-exclusive availability.

Using property rights concepts, the distinction between activities designed to make a resource exclusive and those designed to make it optional becomes blurred. Exclusion activities simply refer to the activities of an owner in preventing the violation of one or more of his property rights. Thus if B decides it is worthwhile to make Y exclusive he is preventing a violation of his rights. Conversely, A's decision to prevent B's Y from affecting him (A) is merely the exclusion of B's activities from violating some property right of A.

(*) We abstract from bilateral monopoly bargaining problems which are often present in externality cases.

The exclusion principle applies for activities which are not scarce as well as those which are scarce. In the case of scarce activities, that the owner is made worse off if someone else engages in the scarce activity is clear and the implications for potential gains from trade if exclusion is feasible (it may not be) are straight forward.(*) In the case of a non-scarce activity, if exclusion is feasible then to the extent that it is engaged in, a non-scarce activity will become scarce. The demand curve of consumers will be revealed and rents earned. To the extent that someone engages in the excludable activity without paying, the owner is worse off in an opportunity sense.

The distinction between long and short-run analysis is important here as well as a comment on the function of prices. A common example of a non-scarce activity of the kind alluded to above is the services of a bridge or road, once built. It is clear that the construction of a bridge or road is a scarce activity. The services of the bridge are short-run in nature as distinct from the longer-run nature of bridge construction and replacement. Since the depreciation of a bridge attributable to one user's crossing is, at the margin, negligible (or too expensive to calculate), marginal cost due to use is zero. Standard theorems then dictate a zero price. If congestion develops, then marginal use cost is larger than zero and the services become scarce. A price for rationing would then be appropriate. However, even if there is no congestion, the feasibility of exclusion means that information about the value of the bridge's services is obtainable if pricing is instituted. The fact that the bridge is "indivisable" or lumpy with respect to the time dimension of its wear is merely a problem of the large units of its measurements. This point becomes clearer if we consider the spectrum of other possible methods

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(*) Possible complications here may occur in cases where exclusion with respect to one activity may imply exclusion with respect to others.

of providing the same service (e.g. river crossing), which are not so "lumpy": one-car ferries, two-car ferries, wooden bridges offering one-way traffic, passenger ferries only. For many of these we may not hesitate to charge. Yet the construction of the bridge rather than these other modes may be done because this bridge is a more efficient method of providing the crossing service. We will return to this aspect in the next section.

So, to summarize what we have just argued, an externality usually occurs when due to certain legal and technological constraints an asset or activity does not qualify for private property. But there is nothing automatic or "inevitable" about certain resources falling in this category because the constraints and cost impinging on transfer and exclusion are weighted into the decision-makers' benefit-cost calculation, and the benefits may exceed the costs; in some cases it may be "worth it" to enforce one's rights,in others it may not be.

c. Externalities Defined

The Buchanan and Stubblebine analysis presents a number of necessary conditions but the mathematics are not sufficient to illuminate the basic economic problem involved in an externality. More accurately, the definitions are depictions of the symptoms of the externality problem but do not, I would suggest, go far enough and explore the cause of the problem which cannot be divorced from real world technological, legal, and institutional considerations. Let us now offer a definition of externality in light of the above comments.

In cases where there are constraints by way of legal restrictions and/or costs of excluding A from consuming aspects of a certain activity y_{ij}, or vector of activities Y, by B who has the legal property rights to that

activity, and where the costs to A of not consuming y_{ij} (or Y) outweigh the benefits of not consuming, some or all of B's privately determined equilibrium level of $\bar{y}_{ij}$ (or $\bar{Y}$) will enter A's equilibrium consumption basket. In other words,

$$(8) \qquad \begin{aligned} \bar{U}^A &= U^A(\bar{X}^A, \bar{Y}) \\ \bar{U}^B &= U^B(\bar{X}^B, \bar{Y}) \end{aligned}$$

where $\bar{U}^A$, $\bar{U}^B$ are equilibrium levels of utility of A & B respectively resulting from the equilibrium consumption baskets $(\bar{X}^A, \bar{Y})$ and $(\bar{X}^B, \bar{Y})$. Condition (8) is not "incidental" and, as implied by the use of equilibrium values, is the result of conscious utility maximizing behaviour under the constraints referred to.

For simplicity, let us just consider one element of Y, y_{ij}. As B has the property rights to decide the quantitative value of Y or any y_{ij} his own private equilibrium will leave him where,

$$(9) \qquad \frac{U^B_{y_{ij}}}{U^B_{X_k}} - \frac{P_{y_{ij}}}{P_{X_k}} = 0 \qquad (y_{ij} = \bar{y}_{ij},\ X^B_k = \bar{X}^B_k)$$

and in cases where A's consumption of y_{ij} matters to him,

$$(10a) \qquad \frac{U^A_{y_{ij}}}{U^A_{X_k}} \neq 0 \qquad (y_{ij} = \bar{y}_{ij},\ X^A_K = \bar{X}^A_K)$$

or

$$(10b) \qquad U^A_{y_{ij}} \Big|_{\bar{y}_{ij}} = 0 \quad \text{and} \quad \int_0^{\bar{y}_{ij}} U^A_{y_{ij}}\, dy_{ij} \gtrless 0$$

Condition (9) and (10) would normally imply that gains from trade exist in altering the level of y_{ij}. If there are no restrictions on such

trade then the equilibrium value of y_{ij} will satisfy:

$$(11) \qquad \frac{U^B_{y_{ij}}}{U^B_{X_k}} + \frac{U^A_{y_{ij}}}{U^A_{X_k}} = \frac{P_{y_{ij}}}{P_{y_k}} \qquad (y_{ij} = \bar{\bar{y}}_{ij},\ X^A_k = \bar{\bar{X}}^A_k,\ X^B_k = \bar{\bar{X}}^B_k)$$

otherwise the equilibrium value of y_{ij} satisfying (9) and (10) will prevail and the second necessary condition for an externality will be fulfilled.(*)

d. Problems in Interpretation

This may be one instance where mathematics is an inferior method of communication to written language. It cannot be claimed that the above "definition" is without some interpretive problems or even ambiguities.

Firstly, it may be asked why B would ever undertake to exclude A if A's consumption did not detract from, or interfere with B's. Notwithstanding the remarks already made about the possibility to B of blackmailing A or "gouging" him for some consumer's surplus, the answer is that B may not. That is to say, since there may be no benefits to B of excluding A, B will not incur costs to do so.(**)

The simultaneous presence of high transfer costs may also induce a a decision by B not to exclude even where exclusion is cheap. The incentive to exclude, recall, was that it created the potential for gains from trade. But where it is known that such gains may not be realisable because of high exchange

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(*) As in Buchanan and Stubblebines' paper, "technical" externalities involved in the "interaction" of the outputs and/or factors employed by firms can be included in the analysis by substituting production for utility functions.

(**) A's decision to opt out of y_{ij}, which may be a bad, is another matter but one which may not be independent of B's decision not to exclude. B is merely passing the costs of exclusion on to A. Since this may constitute a violation of some property right of A's, the final court designated excluded may well become B.

costs, the potential benefits of exclusion - the gains from trade - do not exist.

B may gain from exclusion if the price that A is willing to pay to alter the status quo ($\bar{y}_{ij}$) is more than enough to compensate B for such a change. For example, if B's flower garden is in view of A's house, A may wish to have B increase its size or change the flower mix.(*) Without a feasible method of exclusion, any change made in the garden may go uncompensated for by B. "Exclusion" in this case is tantamount to the actual exchange.

A second problem involves interpreting the individual's "consumption" of the particular y_{ij} which may differ both in qualitative and in quantitative terms. For example your "consumption" of a concert may differ from mine either in "quantity" (you sit at the back, I sit at the front or we attend for different lengths of time) and/or in "quality" (you go for the conductor, I go for the particular piece of music). In regard to the "quantity" aspect, such differences may in principle be abstracted from by properly adjusting utility functions, the prices, or in properly defining the units of measurement.

Bradford {1971} has recently called attention to the quantity aspects by noting that "the essential point is that there are no observable counterparts to the variables."(**)

While he is dealing with public goods, the remarks are equally applicable to externalities. He prefers to deal with this aspect of the problem by defining for a given "common good" (our y_{ij}), X_{n+k}, new variables for each of the S individuals in the world the relations $X^i_{n+k} = X_{n+k}$. This he

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(*) We will subsequently return to problems of defining the relevant activity.

(**) Bradford {1971}, p. 1122 (italics original).

calls i's "pseudo consumption" of collective good X_{n+k}" or, for simplicity, i's consumption of that good."(*) He emphasizes however, that there is no observable counterpart of each X^i_{n+k} so that in practice we can only deal with X_{n+k} which is observable. This point, however, should not be very worisome unless a conflict of interests arises resulting from the magnitude of A's consumption of y_{ij} (or desired size of y_{ij}) having implications for the magnitude consumed by B. Even in this case, however, the quantitative differences in consumption (or desired levels of y_{ij}) will take on observable values.

Regarding the quality aspects of the asset in question, a more fruitful approach may involve the "characteristics" aspects of consumption as explored by Lancaster {1966}. Here, each good is viewed as a bundle of characteristics related by a "consumption technology". In the flower bed example such characteristics may include the types of flowers, their arrangement, the fragrances they exude, etc. The trade-off in characteristics space makes many of these characteristics scarce. For example, while more than one person can view any sort of flower bed ("viewing" is"non scarce"), seeing one with 50% roses and 50% tulips can only be done at the expense of someone else who may wish the mix to be 75% roses and 25% tulips.

Recognizing this aspect of the problem means that the "conflicts" inherent in externalities, particularly those involving "goods" ($U^A_{y_{ij}} > 0$, $U^B_{y_{ij}} > 0$), are more easily seen. Moreover as Minassian {1964, 1967} has pointed out, the more real and interesting conflicts regarding resource allocation come to light. Thus the more relevant questions with regard to television broadcasting may not be how many people should be reached, but rather what program mix should be allowed. More opera means fewer westerns. While opera lovers and western

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(*) Ibid., p. 1124.

buffs may both tune in simultaneously, the amount of "T.V." actually watched (our $\bar{y}_{ij}$) will not be independent of what is broadcast.

Much of the confusion surrounding externalities and public goods results from not recognizing the multi-dimensional aspects of certain assets. Considering any good with many characteristics, some of these have private property aspects and some have common property aspects. The transportation services of a car are private, its pollution is common. Education provides each person with "consumption" aspects and human capital which he can later capitalize, which is private, but it also raises the marginal products, and hence wealth, of future co-workers (a common property aspect). In considering any particular externality case, we must be certain to clearly analyse the aspects or characteristics of the asset in question which are "in conflict". In the short-run, the various characteristics of a good (or bad) are essentially joint products so that an injunction brought to bear against one aspect will also prohibit another. For example, solution of the early morning lawn mowing nuisance by prohibition of the mowing focuses on the wrong aspect of the problem (mowing instead of noise making). If silencers or silent mowers do not exist then this solution may be appropriate. In the longer run, however, the characteristics mix (or the spectrum of products in the same intrinsic commodity group) is variable. As argued above, it is at this level that the more important and interesting conflicts arise. Specification of our model in terms simply of y_{ij} has ignored these problems.

Buchanan [1966] has touched indirectly on this aspect by applying classical joint-supply analysis to the problem of externalities. The joint supply aspect of the problem may be appreciated if we compare the production of sheep (X^1) which jointly-supplies wool ($X^1_{y_1}$) and mutton ($X^1_{y_2}$) to the planting of a flower garden (X^2) which jointly supplies a "nice view" to A ($X^2_{y_A}$)

and to B ($X^2_{y_B}$). Now the individual "consumption" units y_A and y_B need not be qualitatively or quantitatively similar, just as wool and mutton are different "goods". Thus y_A may be one characteristic, y_B another. Concentration of the analysis on a single dimension would not be appropriate unless there were some technological constraint which meant that for any provision of X^i, the $X^i_{y_i}$, $X^i_{y_k}$ consumptions units can only be provided in fixed proportions. As Buchanan has noted, "any assumption of "technical" fixity"(*) is unduly restrictive. The characteristics "mix" of a given externality is variable and any analysis and solution should recognize this. Where these characteristics can be specified and measured the analysis presented in the last section would be amended to consider this. If however, such differences are not easily measurable, a second best approach would involve uni-dimensional analysis.

A final point regarding any analysis of externalities cases regards identification of the common property resource or "the externality" or "spillover". Consider the following two familar examples. (a) A factory pollutes the air with smoke that falls on Jones's laundry which is hanging out to dry. (b) A cattleman's cows cross onto a farmers land and trample his wheat. What is the proper "common variable" to the parties in each dispute (our y_{ij})? Many people would say the smoke in (a) and the cows in (b), since these are the "cause" or the "spillover". If these cases were argued in a court, however, litigation would not be in terms of cows or smoke but in terms of Jones' rights or the factory's rights to the use of the air in (a) or the farmer's property rights to the use of his own land in (b). Air and land are the common properties being disputed here. They are common in the property aspect defined earlier; exclusion is costly (or impossible) and transfer of rights is difficult (or expensive). That commonality is not synonymous with non-scarcity is evident from

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(*) Buchanan {1966} p. 410.

the fact that more of what the factory wants to use the air for, means less of what Jones wants to use it for and vice versa.

IV. SUMMARY AND SOME POLICY CONSIDERATIONS

Many of the ideas presented in this paper are derived from other contributors to the literature. We have attempted to assimilate the contributions into a more complete examination of the cause of externalities by considering both exchange and enforcement costs of property rights. The relationship of enforcement costs has previously been examined, for example, in Buchanan {1966}, Millward {1970}, Musgrave {1959}, James {1971} and Minassian {1964}to mention a few. The role of transactions costs has recently been playing a larger part in theoretical analyses, but has previously been examined in the context of externalities by Coase {1960} , Demsetz {1964}, {1966}, {1967}, {1969}, as well as Cheung {1969}, {1970}. All of these papers, as well as others, have solved some of the relevant problems, but nowhere is any of it tied together. The implications of the analysis put forth here for other papers than the Buchanan and Stubblebine piece are left to the reader in order to avoid a tedious review of much of the current literature.

The discussions in section II on the elements of property rights has endeavoured to summarize and tie together the literature in this area and to explore the interface between legal and economic concepts. In the broadest sense, the legal system may be viewed not only as an exogenous institutional constraint on the operation of the market mechanism for allocating resources, but as a mechanism itself. For example the allocation of resources involved in the settlement of a nuisance dispute may be settled in the courts, where the court's decision is based upon legislative and common law.

Regarding the implications for policy, a few general remarks may be made. Firstly, the property rights aspect which we have treated here suggests that the costs of exclusion and transfer may often be significantly related to the particular institutional, legal and political arrangements which prevail at any given moment so that a "solution" or Pareto improvement might be affected by alteration in this area rather than a purely "price-oriented" policy such as a tax or subsidy scheme. In any case, it is well to remember that the market is but one of many allocating mechanisms that may be employed. And given normative judgement that we are interested in the efficient allocation of resources, including those resources engaged in the allocation of other resources, the choice among discriminating mechanisms should be made also on the basis of efficiency. Demsetz has pointed out(*) that the view that often prevails in much public policy economics is a "nirvana" approach which implicitely sees the choice as between an ideal norm and an existing imperfect institutional arrangement. For "ideal norm" read costlessly operating market and for "imperfect institutional arrangement" read anything from a costly market to a government scheme whose implications differ from the "deal" and are thus imperfect. Demsetz argues, as we shall see here, for a "comparative institution" approach in which the relevant choice is between real institutional arrangements:

> ... In practice, those who adopt the nirvana viewpoint seek to discover discrepancies between the ideal and the real and if discrepancies are found, they deduce that the real is inefficient. Users of this comparative institution approach attempt to assess which alternative real institutional arrangement seems best able to cope with the economic problem; practitioners of this approach may use an ideal norm to provide standards from which divergencies are assessed for all practical alternatives of interest and select as efficient that alternative which seems most likely to minimise the divergence ...(**)

(*) Demsetz, {1969 }.

(**) Ibid. p.1

Many definitions of externality (from which we have tried to depart) use a nirvana approach and are guilty of what Demsetz would call the "fallacy of the free lunch". For example, to say that a factor is "non-optimally" employed because the firm's demand curve for that factor fails to account for its effect on another firm is to use the word non-optimal in an ambiguous and misleading fashion. Assuming, that the market is perfect for the particular factor (that is to say, no monopsonistic or monopolistic elements are present), are we then saying that this market can be improved upon? And if it can, at what price? If we assume that the costs of taking account of the factor's effects on the other firm exceed the benefits to be derived from such an effect, then this would explain the observed absence. In this case we cannot say that the market has led to a non-optimaly employed resource because to make this assertion is to deny that scarcity (with regard to resources associated with the use of a market) is relevant to optimality. The nirvana approach to the definition of externalities is either incomplete or else relies on an implicit assumption of non-scarcity. And in suggesting that the market generates "incomplete" adjustments to externalities, this approach, "by comparing the adjustments with the ideal, is led further to equate incomplete to nonoptimal"(*) which would be correct only if adjusting for such effects were free.

The problem posed by the costs of exercising property rights are no different in principle than the problem posed by any cost. For example, often iron ore is left in the ground simply because it is too costly, given present technology and demand for iron ore, to bring it to the surface. But no one claims that the mining of ore is in any sense inefficient merely because the mining of a field is not complete.

(*) Ibid. p.4.

Now it may well be that there are alternative ways of mining that would be less costly and so a given ore field may in this case be meaningfully described as inefficiently mined. And likewise, allocative mechanisms other than the market may exist for certain resources when exchange and enforcement costs are high. While in the long run we can accept the hypothesis that people make choices which actually make them best off as judged by themselves ex ante, in the short run such an assertion would be dubious. The status quo may have been arrived at through a rational, cost calculating process but this is not prima facie evidence that there are no alternative schemes which yield higher returns. If we were to accept the complacent attitude that "where we are is the best we can do", we would have to infer that no new forms of enterprise, mechanisms for allocating resources, or methods of gathering information could possibly be discovered in the future and that no further innovations - managerial, technological or institutional - remain to be discovered.(*) Such an assumption would also imply that knowledge of the future was perfect and hence costless.

(*) Mishan in a footnote makes this point. c.f. {1967} , p.269n.

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