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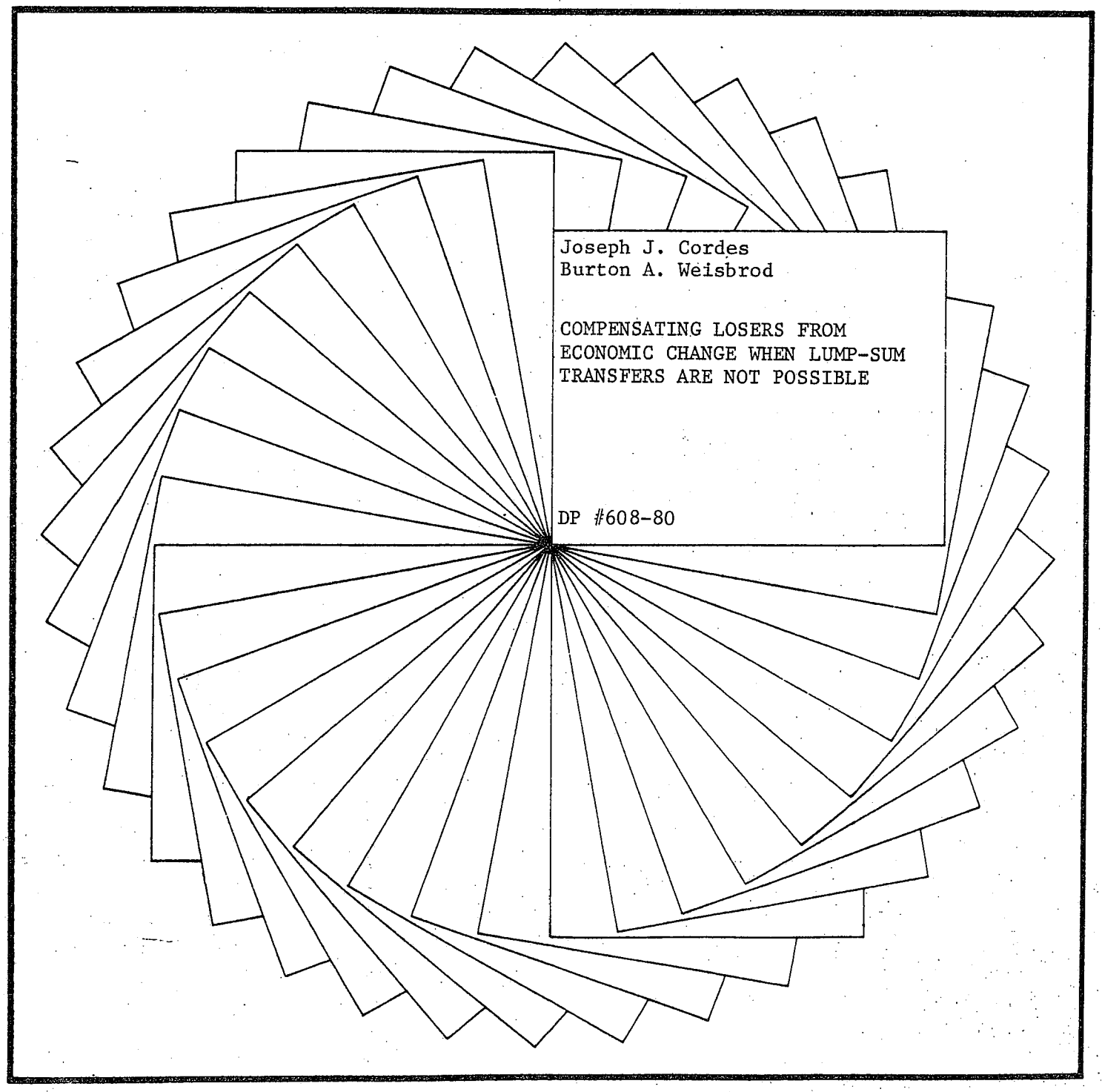

COMPENSATING LOSERS FROM ECONOMIC CHANGE WHEN LUMP-SUM TRANSFERS ARE NOT POSSIBLE

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ABSTRACT

Public and private sector activities often bring about undesired income-distributional effects, and these give rise to considerations of ways to compensate the losers. When "lump-sum" compensation is not possible, "second-best" compensation arrangements need to be identified and evaluated. The term "compensation" is often used to mean explicit payments from those who gain from a policy change, to those who lose. We find it useful to include in "compensation" any arrangement that reduces, from what it would otherwise be, an unintended net loss suffered by some person. We have in mind, in particular, those losses resulting from public sector activities, but our analysis should apply to any situation in which someone is harmed as an unintended side-effect of some otherwise desirable action.

The objectives of this paper are to (1) identify the various alternative ways of providing compensation; (2) determine how the alternatives differ from each other in terms of their economic impacts; and (3) determine how to choose among the alternatives so as to maximize social welfare. We identify two broad categories of compensatory mechanisms: "Implicit" arrangements, which rely on constraints imposed ex ante on public actions in order to minimize the harm imposed on certain groups; and "explicit" compensation arrangements, which avoid imposing such constraints and instead attempt ex post to offset some or all of the harm done.

Three criteria are identified as determining which compensation mechanism is "best." In terms of equity, compensation arrangements may be

compared on the basis of (1) target efficiency of the compensatory benefits, and (2) the manner in which the costs of compensation are distributed. In terms of efficiency, compensation mechanisms may be compared on the basis of (3) the real costs required to provide a given amount of compensation--costs which, in the real world of non-lump-sum taxes and transfers, may be sizeable. We show that there are identifiable situations in which one form of compensation is preferable to others in terms of these criteria.

I. INTRODUCTION

When "lump-sum" compensation is not possible, the maximization of social welfare sometimes requires that "second-best" compensation arrangements be identified. The term "compensation" is often limited to mean explicit payments from those who gain from a policy change, to those who lose.[1] That is too narrow. We find it useful to include in "compensation" any arrangement--not simply an explicit payment--that reduces, from what it would otherwise be, an unintended net loss suffered by some person. We have in mind, in particular, those losses resulting from public sector activities, but our analysis should apply to any situation in which someone is harmed as an unintended side-effect of some otherwise desirable action.

The objectives of this paper are (1) to identify the various alternative ways of providing compensation; (2) to determine how the alternatives differ from each other in terms of their economic impacts; and (3) to determine how to choose among the alternatives so as to maximize social welfare. Thus, we seek to contribute to the development of a normative model of a "desirable"--equitable and efficient--compensatory mechanism. Our analysis also contributes to the development of a positive model of when and in what form compensation will be made.

The balance of Section I of this paper examines the concept of compensation as a mechanism for achieving potential Pareto improvements in resource allocation. Section II discusses the menu of types of compensation methods--in addition to lump-sum transfers--that are available. Section III begins the process of normative evaluation of

the alternative compensation mechanisms, and Section IV defines and discusses the concept of an optimal compensation arrangement. Section V summarizes and concludes the paper.

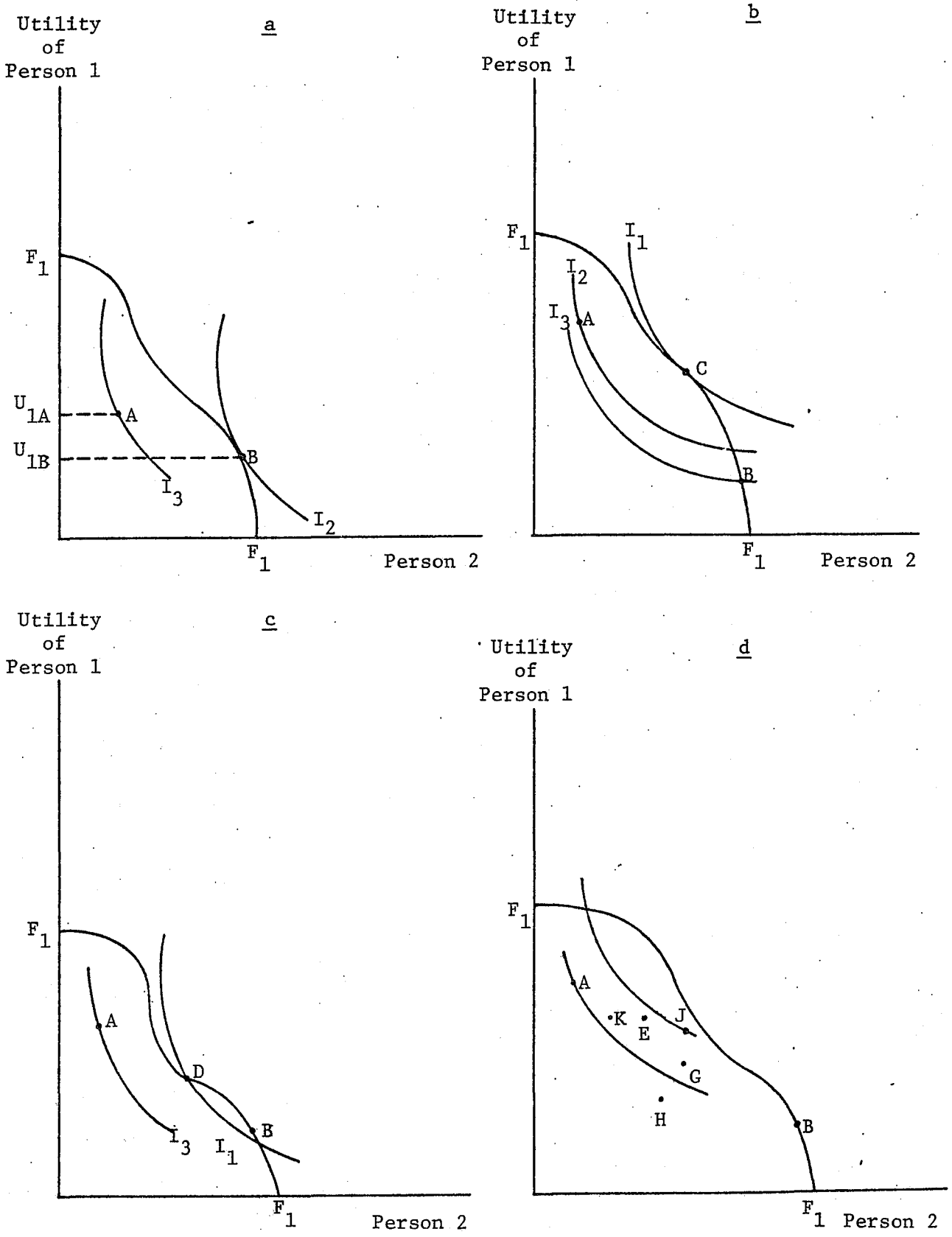
Despite the extensive theoretic welfare economics literature concerning compensation of persons harmed by public actions, relatively little research has been devoted to the analysis of existing compensatory institutions.[2] This is largely because cost-benefit analysts have traditionally ignored distributional issues (and, hence, compensation issues), choosing instead to evaluate the "desirability" of public programs in terms of economic efficiency.[3]

The political attractiveness--and hence, the viability--of public policies, however, often depends crucially on the distributions of their costs and benefits, and compensation (or its absence) affects these distributions. A truly comprehensive approach to the economic evaluation of public policy must, therefore, recognize the importance of compensation for facilitating policy change.[4]

There are numerous examples of public policies that, absent compensation, would be efficient, but that unintentionally harm some members of society. A familiar representation of such a case is given in Figure 1(a). The locus F_1F_1 is the utility possibility frontier. Point A, on social indifference curve I_3, indicates the initial--and nonoptimal--utility level for each individual, while B is attained by adoption of some public policy without compensation.[5]

Individual 1 would be harmed as a consequence of moving from A to B. We refer to person 1's loss as an unintended harm of the public activity

Figure 1


a
Utility of Person 1
F_1
U_{1A}
A
U_{1B}
B
I_3
I_2
F_1
Person 2
b
Utility of Person 1
F_1
I_1
I_2
I_3
A
C
B
F_1
Person 2
c
Utility of Person 1
F_1
A
D
B
I_3
I_1
F_1
Person 2
d
Utility of Person 1
F_1
A
K
E
J
G
H
B
F_1
Person 2

if, as in the ordinary case, a loss to person 1 does not, ipso facto, raise social welfare.

In general, whether or not any unintended side-effect is malproductive, however, is another matter. By malproductive we mean an effect that prevents the achievement of a potential Pareto improvement. Two issues are involved: (1) Is the unintended harm great enough relative to all other net favorable effects of the proposed project so that in the absence of (at least some) compensation social welfare is reduced? (2) Is the person who would be unintentionally harmed in a position to block a Pareto-efficient project?

If the answer to both questions is no, the loss suffered by individual 1, while unintended, would not be malproductive. In figure 1(a), if person 1 cannot block the move from A to B, compensation would not be necessary to achieve the social welfare increase.

The decline in utility for person 1, from U_{1A} to U_{1B}, would be malproductive, however, if the answer to either question, or both, were yes. The unintended harm might be regarded as undesirable on equity grounds if the answer to question 1 were yes. Figure 1(b) depicts the case in which the harm to individual 1 is so great relative to the gain to individual 2 that moving from A to B without compensation would reduce social welfare (from I_3 to I_1).

The unintended harm to person 1 would be malproductive on efficiency grounds if the answer to question 2 were yes, even though the answer to question 1 were no--that is, if the harmed person were able to block an increase in social welfare or a potential Pareto improvement.[6] This would

occur whenever protective measures built into the political system--e.g., such "due process" procedures as public hearings, and litigation--permit an efficient project to be stopped by a relatively small number of persons who would be hurt, even though the benefits to the gainers would be far in excess of the losses to losers. In terms of Figure 1(a), such political protections could enable individual 1 to block the move from A to B, though such a move would be socially optimal.

Thus, an unintended loss is undesired (malproductive) whenever reducing that loss enhances actual (not merely potential) social welfare. Figure 1(b) illustrates the situation in which reducing the loss to person 1 by moving from A to C rather than B enhances social welfare (from I_2 to I_1) in the process of making the distribution of gains and losses more equal. Figure 1(c), by contrast, illustrates a case in which reducing the loss to person 1 by moving to D rather than B, while still leaving that person worse off, is assumed to be sufficient to prevent him or her from blocking the move to the frontier F_1F_1; in this case partial compensation of the loser is sufficient to avoid the blocking action and, as a result, social welfare increases from I_3 to I_1. Since there are costs to the harmed party to fight the change, partial compensation will generally be sufficient.

Figures 1(b) and 1(c) embody, however, the unrealistic assumption that undesired losses may be reduced in a nondistorting--that is, lump sum--manner. If such compensation mechanisms are posited, the problem is conceptually straightforward. One must simply decide how much compensation is required to maximize the (feasible) gain in social welfare obtained by moving from A to various points on the frontier F_1F_1.

In practice, compensation is not costless, in terms of either administrative costs or distorting incentives. When compensation involves such real costs, it is not possible simultaneously to attain the frontier F_1F_1 and to satisfy the constraint on undesired losses. This is illustrated in Figure 1(d). When lump-sum compensation is not possible, one must choose among the "status quo," A, the "uncompensated policy change," B, and a variety of second-best interior points, such as E, G, J, H, and K, which combine the policy change with some partial compensation. If B is ruled out as either inferior to A or unattainable, the problem is to determine how much compensation to provide, and also how to provide it. Regarding how much to pay, compensation arrangement H should be rejected altogether because there are attainable Pareto-superior alternatives (E, G, J). Compensation arrangements E and K provide equal (though incomplete) compensation to individual 1, but E does so at lower welfare cost to individual 2 and is, thus, preferred. Similarly, arrangements G and J provide the same welfare to individual 2, but arrangement J, which provides more compensation to individual 1, is preferred. To anticipate a discussion later in this paper, the existence of points such as K and G, which are dominated by other attainable points, E and J, respectively, is possible as alternative compensation mechanisms entail different real costs of providing a given level of compensation.

We turn next to the forms that compensation may take.

II. TYPES OF COMPENSATION MECHANISMS

Compensatory arrangements vary in form as well as degree. The available alternatives involve implicit as well as explicit forms of compensation. In this section we discuss a typology of compensation mechanisms; later we turn to their evaluation.[7]

Implicit Compensation

Compensation arrangements can rely on formal payments (lump sum or other), but they may also involve structuring of policy decisions so as to minimize or optimize the harm done. There are four dimensions of public program design and implementation that may be modified in order to deal with damages that are malproductive or that we wish, for any other reason, to reduce: timing, technique, output level, and output type.[8]

Timing. Adverse effects of public activities may be reduced by timing the changes so that affected parties can adjust their behavior. This may be accomplished either by early announcement of a future policy change, or by postponed enforcement of a policy change that has already been approved.

One form of early announcement involves procedural requirements that proposed policy changes be formally discussed in public hearings. A variety of "phasing-in" provisions included in both social regulation and, more recently, economic deregulation legislation, attempt to minimize the burden of these policy changes by delaying their full implementation.

For example, the 1977 Clean Air Amendments require automobile manufacturers to comply with certain auto emissions standards--but not until the 1980s. Similarly, the recently passed Airline Deregulation Bill provides for gradual phasing in of its provisions to minimize the burden of deregulation on the airlines.[9]

Technique. Undesired harms may also be reduced by varying the techniques chosen for producing a particular public output or for regulating private behavior. For example, the undesired harm caused by the siting of public works projects, such as highways and dams, can often be reduced by relocating the facilities. Analogously, environmental externalities can be regulated through the imposition of either standards or taxes. Since standards, as generally enforced (though not as logically required) impose lower financial penalties on those regulated than do taxes (Buchanan and Tullock, 1975), control of environmental externalities through the imposition of standards rather than taxes can be viewed as a form of implicit compensation to firms that would be harmed by stricter enforcement of, or more severe penalties for violations of, environmental controls.

Level and Type of Output. Undesired damages may also be reduced by modifying the level or type of public output. Public works projects may be reduced in scope to reduce harmful impacts. In some cases, the type of output produced may also be modified to achieve this end. Urban renewal projects are a particularly good illustration of a case in which both types of output modifications are possible. Such projects often impose substantial losses on households displaced from the project site. These losses may be reduced either by demolishing fewer units or by focusing urban renewal

efforts more on renovation than on demolition of existing housing on the renewal site.

Government regulations may also be reduced in stringency or reduced in coverage to minimize undesired burdens on those regulated. One popular method of reducing the coverage of various regulations is "grandfathering." Grandfather clauses reduce undesired harms by granting formal exemptions from rule changes to individuals and firms that had operated under the "old" rules. Changes in zoning rules, for example, often include provision for "nonconforming use"--a form of grandfathering that allows those owning property before the zoning change to continue to use that property in the same way after change, even though such uses are prohibited under the new zoning ordinance. Similarly, changes in occupation licensing and certification may include protection for older workers who do not meet the newer and more stringent standards. In all of these cases the social trade-off between equity and efficiency is evident. Only a bit less clear is the realization of potential blocking action which, without compensation, might prevent any change at all.

Grandfathering is also evident in the consumer-goods area. Changes in regulation of consumer products may sometimes exempt output already produced; for example, prohibition by the Food and Drug Administration of certain drugs--e.g., saccharine--has allowed manufacturers to sell existing inventories even though a determination has been made that the commodities may no longer be produced because they are either unsafe or ineffective.

Explicit Compensation

Another class of compensation mechanisms uses the tax and spending powers of government to provide formal payments to losers. Explicit compensation includes: (1) cash payments to those harmed by particular public actions; (2) in-kind compensation, through the provision of specific goods and services to those harmed; and (3) compensation extended through special tax concessions (i.e., tax expenditures).

Cash compensation. The implicit compensation arrangements discussed above have the essential feature of imposing constraints on project design or implementation that prevent harm being imposed on certain groups. An alternative approach is to take action after the fact--to offset any harm done, by appropriate sidepayments. This approach has been adopted in a number of policy areas. Renters and homeowners displaced by federally funded public works projects, such as urban renewal and highway construction, are currently eligible for relocation assistance payments (Cordes, 1979). Workers who lose employment when restrictions on import competition are relaxed are eligible for "trade readjustment" allowances. Airline employees who lose their jobs as a result of deregulation are eligible for cash assistance as a supplement to unemployment compensation (Goldfarb, 1980).

Litigation--allowing injured parties to sue the government--is another approach to providing compensation. This is illustrated by Congressional action permitting American Indians to sue the U.S. Government to obtain compensation for land taken. Since governments can take actions that discourage or encourage damage suits, the latter amount to actions that expand the realm of compensation.

In-kind compensation. Formal side payments can also be extended through the provisions of goods and services (non-cash) to those harmed by public actions. With regard to persons forced by urban renewal or highway construction to move, it has been proposed that instead of cash relocation assistance payments, such households be provided with replacement housing, either through construction of subsidized housing for displacees, or by receiving preferred treatment in obtaining public housing (Hartman, 1971). Similarly, workers displaced from their jobs either by trade liberalization or deregulation are eligible for certain job re-training programs.

In a related vein, compensation may also be provided through constrained cash subsidies tied to the purchase of devices that facilitate compliance with governmentally imposed regulations. This approach has been used in the regulation of environmental quality; firms can receive public subsidies tied to the purchase of pollution control equipment they are required by law to install. The Clean Air Amendments of 1977 also make public funding available to assist the auto industry in developing devices to control auto emissions.

Compensation through tax expenditures. Tax scholars have long recognized that individuals can be subsidized through tax concessions as well as through direct expenditures. Such implicit cash compensation devices can be used in place of either explicit cash or in-kind compensation. For example, firms required to comply with particular government regulations can be granted tax credits for the purchase of inputs necessary for compliance, and individuals suffering "windfall" losses due to policy shifts can be granted tax deductions for such losses--e.g., if the losses are defined as "casualty losses" for income tax purposes.

III. WHAT IS A "GOOD" COMPENSATION ARRANGEMENT?

We have identified several institutional arrangements for providing compensation. These arrangements are alternative instruments for achieving particular compensation targets. Choosing the "best" alternative requires the specification of criteria for defining desirable attributes of a compensation mechanism. In this section we propose a set of such criteria, based on a social welfare function with both equity and efficiency as arguments.

Equity Criteria

One criterion for assessing a compensation mechanism is distributional equity. In examining the distributional impacts of various compensation arrangements, it is useful to distinguish between: (1) the distribution of benefits obtained by recipients of compensation; and (2) the distribution of the costs imposed on taxpayers by compensation.

Completeness. A relevant feature of any compensation arrangement is the extent to which that arrangement succeeds in providing the desired amount of compensation to all the intended persons or firms, and only to them. This is essentially the concept of "target efficiency" that one of us has developed earlier (Weisbrod, 1975). That is, compensation mechanisms may be compared in terms of their (1) vertical target efficiency-the extent to which a particular compensation scheme benefits only those suffering net losses; and (2) horizontal target efficiency--the extent to which a particular compensation scheme provides the desired compensation to all the target group, that is, to all unintended net losers.

A compensation scheme would be vertically efficient whenever compensation was received only by the target group. It would be horizontally efficient whenever: (1) all those in the target group received compensation; and (2) each member of the target group received the "desired" amount of compensation (not necessarily equal for all recipients). Normative judgments must be made in order to determine the amount of compensation that ought to be paid to those suffering losses. However, positive comparisons of various compensation arrangements can be made if horizontal efficiency were defined with reference to a full compensation benchmark. That is, compensation arrangements can be classified usefully in terms of whether they partially compensate, exactly compensate, or overcompensate net losers. Normative evaluations of compensation schemes can then be made on the basis of such groupings.

Equitable incidence of the costs of compensation. In order to provide compensation, whether explicitly or implicitly, certain costs must be incurred. Compensation mechanisms can be expected to differ in the way these costs are distributed among the population.

Implicit compensation schemes, even though they do not generate budgetary costs, are not costless in real terms. Postponement of a policy change imposes an opportunity cost equal to the discounted present value of benefits foregone or delayed. Changes in project design generate similar opportunity costs. Thus, the real costs of compensation may be borne by those who forego benefits of the delayed or modified project.

The incidence of compensation costs would generally differ if compensation were made in a form that required raising funds from taxpayers. The

distributional impact on taxpayers depends, of course, on the means of financing the compensation payments; compensation payments financed through general revenues would not have the same incidence as would compensation financed through one or another particular tax. These considerations suggest that compensation arrangements also should be judged on the basis of whether the costs of providing compensation are distributed fairly.

Efficiency Criteria

Compensation is typically thought of as involving essentially pure transfer payments. Real resources are used, however, in administering the program. Allocative distortions can also be expected to occur since the expectation either of having to pay, or of receiving compensation, creates incentives for affected parties to change their behavior. Hence, it is appropriate to evaluate alternative compensation schemes in terms of their impacts on allocative efficiency.

Real costs of compensation. Real social costs are incurred in order to provide either implicit or explicit compensation. As noted above, implicit compensation implies foregone or delayed benefits. Explicit compensation arrangements, by contrast--whether in cash or in kind--do not involve losses in program benefits. Some real social costs are incurred however, in order to compensate losers explicitly. Real resources are required to identify the losers, to estimate the individual losses, and to administer the appropriate payments or to operate the in-kind compensation program.

Other things being equal, it is appropriate to utilize a compensation arrangement that minimizes the real costs per dollar of compensation. Since two or more compensation mechanisms might be used, the general rule for choosing compensation mechanisms efficiently would be to equate the marginal real costs per dollar of compensation through each mechanism (assuming, of course, that second-order conditions held).

Incentive effects of compensation. Both payments and receipt of compensation create incentive effects. If, for example, a government agency is required to compensate persons harmed by its activities, the budgetary cost to the agency of programs will be affected. Since projects being considered by an agency are likely to vary in their "compensation intensity"--the ratio of compensation costs to other projects costs--an agency that is required to compensate losers can be expected to shift project selection toward less compensation-intensive projects. We have shown elsewhere that administrative agencies are likely to change their output mix if required to pay compensation out of a fixed budget; more generally, agency response to a compensation requirement will depend on the relationship between the level of compensation and the agency budget (Cordes and Weisbrod, 1979).

Postponement and phasing-in of policy changes also encourages firms and individuals to behave differently than they would if changes were instituted more rapidly. For example, postponement provides time for adversely affected parties to lobby for further modification and/or delay of policy changes. Similarly, it has recently been argued that gradual deregulation of the airline industry resulted in distortions that would have been avoided if deregulations had been more rapid (Kahn, 1979).

The expectation of payment or nonpayment of compensation, the form of any that is "paid", and the way in which compensation is "financed" will affect the net benefits of projects as perceived by various voters. Since voter attitudes can affect program decisions, and since the distribution of voting power is not the same, in general, as the distribution of economic demands, compensatory mechanisms (or their absence) can have a major effect on decisions in the public sector.

Behavioral changes by administrative agencies and by voters, in response to compensation payments and the taxes to finance them, may either enhance or diminish allocational efficiency in the public sector. A requirement that an agency pay compensation out of a fixed budget, for example, is formally equivalent to imposing a tax on the agency's principal activities. The agency's response to this tax may be either efficient or inefficient, depending on such factors as the size of the agency budget prior to compensation, and whether the compensible losses involve real losses or income redistribution (Cordes and Weisbrod, 1979). Similarly, financing compensation through taxes imposed on voters may induce voters to approve more efficient or less efficient levels of output, depending, again, on the nature of the compensible losses and the specific tax instrument chosen (Cordes, 1978).

Whether behavioral changes due to compensation are efficient or inefficient, they represent effects of compensation on real income. Such efficiency effects are clearly relevant to an assessment of the desirability of alternative compensation mechanisms which redistribute income.

IV. CHOOSING AMONG ALTERNATIVE COMPENSATION MECHANISMS

We propose that an "optimal" compensation arrangement has three attributes: (1) it is target efficient in its benefits, (2) it distributes the costs of compensation "fairly," and (3) it provides efficient behavioral incentives, which minimize the real social costs of compensation--that is, it minimizes the allocative distortions on the recipients and the payers of compensation. Each of these criteria reflects a goal of social policy that, we believe, is widely shared: compensating all of those, and only those, who are deemed "deserving" of compensation; placing the cost burden equitably; and achieving these goals at a minimum real cost.

Since our general proposition is that policy decisions extend beyond the choice between payment and nonpayment of compensation, to the choice among alternative means for compensating, we turn now to an application of our framework. Specifically, our criteria are used to identify circumstances under which implicit compensation, through postponed enactment of an announced policy change, would be preferred to explicit compensation through cash.

Target Efficiency of Postponement Compared with Explicit Cash Compensation

In order to compare the target efficiency of postponement with that of cash compensation, we first model how postponement reduces undesired losses. Postponement of a policy change can reduce undesired losses in two ways--by delaying losses, and by providing losers with time to seek out and implement loss-reducing responses. Postponing the implementation of environmental

quality standards, for example, would benefit (compensate) regulated firms in two ways: abatement costs would be delayed, and the firms would have more time to search for the lowest cost abatement technologies.

The amount of implicit compensation, V_i, received by individual or group i, would therefore be:

$$V_i = C_i - \frac{A_i(T)C_i}{(1+r_i)^T} = C_i[1 - \frac{A_i(T)}{(1+r_i)^T}] \qquad (1)$$

where:

V_i is the value of implicit compensation;

C_i is the loss suffered in the absence of postponement;

r_i is the individual's or group's discount rate;

T is the length of postponement (in years); and

$A_i(T)$ is a function describing the extent to which individual or group i can reduce losses through behavioral adjustments.

Rearrangement of equation (1) yields the expression for the ratio of implicit compensation to losses:

$$\frac{V_i}{C_i} = 1 - \frac{A_i(T)}{(1+r_i)^T} \qquad (2)$$

The upper limit of the compensation ratio in equation (2) is one. That is, as a compensatory technique, postponement has the characteristic that losers are compensated fully at most. In general, the coverage afforded to each loser by postponement is determined by the length of postponement, the discount rate, and the ability to make loss-reducing adjustments.

Though a program is delayed the same length of time for all groups, such delay will not provide equal compensation to all groups. Other things being equal, the compensation ratio in equation (2) rises as the numerator, $A_i(T)$, falls and as the denominator, $(1+r_i)^T$, rises. It is readily seen that the denominator increases with the discount rate, r_i. To illustrate the implication of different values of the numerator, assume the loss adjustment process can be represented by the function $A(T) = A^T$, $0 \leq A \leq 1$. $A = 1$ means that no behavioral adjustments are possible; in this case postponement would provide compensation only by delaying the imposition of damages. When A is less than one, losers can make behavioral adjustments during the period of delay that reduces damages to them. Lower values of A reflect superior adjustment abilities.

Thus, ceteris paribus, more implicit compensation will be extended to losers with higher discount rates and/or superior ability to make appropriate behavioral adjustments. If time preferences and/or adjustment abilities vary significantly among losers, a seemingly uniform postponement policy will provide substantially different amounts of implicit compensation. There is no assurance that such differences will be consistent with decision makers' a priori notions of equity. Moreover, since such differences are due to variation in individual time preferences and adjustment abilities, decision makers have little control over the distribution of implicit compensation among various groups of losers, for any given postponement.

The distribution of <u>cash</u> compensation may differ in several ways from that of compensation through postponement. (1) Unlike postponement, cash payments may overcompensate some recipients. The greater risk of overcom-

pensation is a disadvantage of compensating through cash rather than postponement, if great weight is given to avoiding overpayment (i.e., enhancing target efficiency).

(2) The amount of compensation to any given recipient can be varied more easily when cash rather than postponement is used. Cash compensation lends itself more readily than postponement to being structured through, for example, eligiblity rules and/or payment schedules--to provide varying amounts of desired compensation to different groups of losers. This factor becomes more important as the income heterogeneity of the group of losers increases.

Incidence of Compensation Costs

There are important differences in the incidence of the costs of postponement and cash compensation. Postponement (or modification) of programs provides compensation at the expense of foregone program benefits. Therefore, the costs of implicit compensation would automatically be distributed as a function of--though not necessarily in proportion to--net benefits from the program responsible for compensable losses. By contrast, cash compensation must be financed out of either general revenues or other, more specific taxes. Hence, notions of tax equity would influence preferences for postponement rather than cash compensation. Those favoring the benefit principle of taxation should ceteris paribus favor reliance on postponement rather than cash compensation. Those favoring the ability-to-pay principle would not necessarily share this preference.

Real Costs of Compensation

To compare the real costs of postponement and cash compensation, the simple postponement model must be further developed. In general, let $\bar{T}$ be the length of time a program must be delayed in order to offset a given share, $\bar{C}$, of compensible losses. Then, the social opportunity cost, K, of providing $\bar{C}$ units of compensation via postponement, would be:

$$K \equiv NB - \frac{NB}{(1+I)^{\bar{T}}} + I \qquad (3)$$

where:

NB is the present value of net benefits of the program if it is not delayed;

i is the social discount rate;

I is the cost of obtaining information about the compensation target group and the time pattern of their injuries.

Expression (3) indicates that the real costs of compensating through postponement depend on a number of factors.

(1) Other things being equal, K will be greater, the greater the value of NB. Holding constant the time profile of net benefits, this implies that the costs of providing compensation through postponement will be greater the more allocatively efficient is the program that generates the compensible losses. For programs with varying time profiles of net benefits, postponement will be costlier for programs that generate net benefits earlier rather than later in the program's life.

(2) K will be greater the higher the value of i. That is, postponement will be more costly the higher the rate at which net benefits are discounted to present value.

(3) K will be greater the higher the cost of I--that is, of determining the target group and the time pattern of the program's undesired side effects. It is noteworthy, however, that cost I may not vary with the type of compensation mechanisms under consideration; even if explicit cash compensation were to be used, it would be necessary to estimate the present value--and, hence, the time pattern--of a program's deleterious unintended effects.

(4) K will be greater the longer the adjustment (or delay) period, $\bar{T}$. From equations (1) and (2) it is readily seen that $\bar{T}$ increases with the desired compensation ratio, $\bar{C}$, and varies inversely with losers' discount rates and adjustment abilities.

Equation (3) may be rewritten as (4):

$$\frac{K}{NB} = \left[1 - \frac{1}{(1+i)^{\bar{T}}}\right] + \frac{I}{NB} \qquad (4)$$

Equation (4) expresses the transactions cost of compensation as a proportion of net benefits flowing from the program. Even when data on the magnitude of I are not available, the expression $\left[1 - \frac{1}{(1+i)^{\bar{T}}}\right]$--hereinafter referred to as m--may be solved for given values of $\bar{T}$ and i. The value of m may be viewed as a lower bound estimate of the (relative) social costs of postponement.

In order to calculate illustrative values of m, we first solve equation (2) for values of $\bar{T}$; we take the case in which the level of desired compensation (V_i/C_i) is assumed to equal three-fourths of the loss. It is initially assumed that the losers' discount rate, r, equals the social discount rate, i, at which project net benefits are discounted.

Table 1

Costs of Compensation Through Postponement as a Share of Net Benefits, $m = 1 - \frac{1}{(1+i)^{\bar{T}}}$

	Adjustment Factors							
	A=1		A=.9		A=.8		A=.5	
Discount Rate	$\bar{T}$	m	$\bar{T}$	m	$\bar{T}$	m	$\bar{T}$	m
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
4%	35	.75	9.5	.315	5.3	.19	1.9	.075
8%	18	.75	7.6	.45	4.6	.30	1.8	.136
10%	14.5	.75	6.9	.49	4.4	.35	1.75	.160

The assumption that $A(T) = A^T$ is also maintained. Table 1 presents values of m corresponding to varying assumptions about $\bar{T}$ (the required postponement period) needed to achieve a compensation ratio of .75, given varying assumptions about discount rates and adjustment abilities. Having solved equation (2) for $\bar{T}$, calculations of m (in equation 4) may be made, and are presented in Table 1. For example, if the appropriate discount rate is 8% and if delay does not permit any adjustments to be made (A=1), then a delay of 18 years is required to provide compensation of 75% of the losses. This, in turn, requires that gainers forego 75% of the net benefits of the program (m = .75). If adjustments are possible ($A < 1$), then both the required delay and the proportion of net benefits foregone are reduced.

Table 1 also shows the effects of various discount rates on $\bar{T}$ and m. In all cases, the required delay is inversely related to the discount rate. The proportion of net benefits foregone (m) is also inversely related to the discount rate except when delay does not permit adjustments to be made.

A number of economists have argued that the discount rate applied to public projects should be less than that used by individuals. It is easily shown that for given values of the social discount rate, i, and the adjustment ability, A, the trade-off between implicit compensation and net program benefits is more favorable when the discount rate of losers exceeds the social discount rate.

These illustrative calculations have several policy implications. First, Table 1 reveals the presence of a simple trade-off between the level of compensation and foregone net benefits when: (a) postponement reduces losses only by delaying the imposition of damages, (A-1); and (b) the discount rate of losers equals the social discount rate. Specifically, an increase in the ratio of implicit compensation to losses of one percent requires that one percent of net program benefits be foregone (i.e., m = .75 when the desired compensation is assumed to equal .75). This relationship demonstrates rather forcefully that compensation through postponement will be quite costly when there is limited ability to use delayed implementation to make loss-reducing behavioral adjustments.

Our calculations also permit rough estimates to be made of the actual costs of postponement. As an illustration, consider the case of compensating those harmed by proposed deregulation of surface freight transport. It has been estimated that such deregulation of surface freight transport. It has been estimated that such deregulation would

yield net social benefits of at least $4 billion (Moore, 1975). Our calculations in Table 1 suggest that if delayed deregulation did not permit loss-reducing behavioral adjustments to be made (A=1), it would cost roughly $3 billion to reduce three-fourths of undesired losses through postponement (m=.75). If behavioral adjustments could be made, our calculations suggest a plausible cost range of between $300 million (.075 x $4 billion) and $1.96 billion (.49 x $4 billion), depending on the discount rate and the adjustment opportunities.

By comparison, the costs of cash compensation depend directly on: (1) the costs of identifying individuals to be compensated; (2) the costs of measuring individual losses, and (3) the costs of administering the compensation program. Thus, the costs of cash compensation will be sensitive to: the geographic and/or demographic distribution of persons damaged, the extent of the damages imposed, and the frequency with which such damages are imposed.

For example, the costs of identifying those to be compensated--an important matter when compensation is to be paid in cash--are lower the smaller the number and the more readily identifiable are the people to be compensated. By contrast, the cost per dollar of compensation extended through postponement is unaffected by identifiability and declines with the number of those compensated. This follows from the "public good" nature of postponement.[10] That is, a given postponement period is required to provide a given amount of compensation for each loser, regardless of how many losers are to be protected. Consequently, cost considerations would more readily favor postponement than cash compensation when the number of compensatees was large, and losers were not easily identified.

Similarly, transactions and administrative costs per dollar of cash compensation would be sensitive to how frequently the need for compensation arose. For example, consider the case of a program that consisted of projects undertaken repeatedly over a number of years. Procedures for identifying losers, measuring losses, and paying compensation would have to be developed in order to compensate the first generation of recipients. However, once developed, such procedures and institutions could be used, at little additional cost, to extend compensation to subsequent generations of losers. In contrast, such "replicating economies" would not be present with postponement, because each compensible event would entail an opportunity cost equal to foregone net program benefits. Thus, cost considerations would favor reliance on postponement when the compensible event was "unique and non-replicable."

Postponement vs. cash compensation: summary. Postponed enactment of policy changes has been proposed by several analysts as a convenient means of reducing unintended losses (Feldstein, 1976). Our analysis demonstrates that postponement indeed has several attractive features when compared to the alternative of cash compensation. Specifically, postponement will be more equitable than cash if great weight is given to avoiding over-compensation, and if the benefit principle is deemed to be the appropriate norm for sharing the costs of compensation. Postponement may also be more efficient than cash compensation when the undesired losses are imposed by a unique, non-replicable event on a large number of losers who are not easily identified individually.

Postponement also has important limitations. Specifically, postponement may be less equitable than cash if losers are economically

heterogeneous and the ability-to-pay principle is judged to be the proper cost sharing norm. Moreover, though postponement generates modest budgetary costs, the hidden opportunity costs may be quite large. In general, the magnitude of these costs will depend on: (1) the time profile of program costs and benefits; (2) the time preferences of gainers and losers; and (3) the ability of losers to make appropriate behavioral adjustments during the postponement period. Illustrative calculations suggest that such opportunity costs may be quite substantial, and should be recognized in choosing between postponement and cash compensation.

V. SUMMARY AND CONCLUSIONS

The role of compensation in facilitating efficient and equitable policy change deserves greater recognition from economists and policy analysts. If compensation is defined as any institutional arrangement developed specifically to redistribute gains and losses resulting from public actions, it is apparent that there are a number of alternative ways of providing compensation. These alternatives may be grouped into two broad categories. Implicit compensation arrangements rely on constraints imposed ex ante on public actions to minimize the harm imposed on certain groups. Explicit compensation arrangements avoid imposing such constraints, and instead attempt ex post to offset some or all of the harm done.

Various mixes of implicit and explicit compensation may be used to achieve a given compensation goal. Choosing the "best" compensation alternative (or combination) requires that criteria be established for defining "desirable" attributes of compensation. Three such criteria

are identified in the paper. In terms of equity, compensation arrangements may be compared on the basis of (1) target efficiency of the compensatory benefits, and (2) the distributional incidence of the costs of compensation. In terms of efficiency, compensation mechanisms may be compared on the basis of (3), the real costs required to provide a given amount of compensation--costs which, in the real world of non-lump-sum taxes and transfers, may be sizeable. As demonstrated by our analysis of postponement and cash compensation, alternative compensation arrangements do not satisfy each criterion equally well. More significantly, we have shown that there are identifiable situations in which one form of compensation is preferable to others.

NOTES

[1]For example, Mishan's (1960) discussion of the role of compensation refers only to a "compensatory payment" (p. 134).

[2]For a survey of the literature on hypothetical compensation, see Mishan (1960).

[3]For a recent re-statement see Haveman and Weisbrod (1975), and for one attempt to integrate distributional effects into benefit-cost analysis see Weisbrod (1968). Even in a recent graduate textbook that deals entirely with public expenditure analysis, "compensation" is mentioned only once in the index. The associated text does nothing more than mention that compensation is related to distributional considerations, but the "harsh choices" for project selection "...can neither be avoided nor resolved by the techniques of benefit-cost analysis" (Burkhead and Miner, 1976, p. 239). Similarly, examination of Richard Musgrave's The Theory of Public Finance, the graduate textbook that guided a generation of economics graduate students, reveals exactly one short paragraph on compensation; its essential content is that "there is no basis on which to...compensate those who suffer the loss...a political process is needed" (p. 140). See also Harberger (1971), who sets forth the case for focusing on allocative efficiency--and thus, implicitly, disregarding compensation issues--in cost-benefit analysis.

[4]See Schultze (1977), O'Hare (1977), Wolpert (1976), and the Congressional Budget Office (1980). In another recent statement, however, the focus is on the equity of compensation, not on the effects of compensation

on program or project selection; Alan Williams argues that it is important to "ensure that the major intended distributional effects of public projects are neutralized, by...compensation arrangements. ...even small improvements (in compensation)...may lead to disproportionately large reductions in people's sense of injustice" (p. 71).

[5]We assume throughout that the social welfare function is individualistic, with the utility of each person entering positively.

[6]Welfare propositions based on the concept of a potential Pareto improvement have recently been subjected to a critical reappraisal. See, for example, Starrett (1979). Our analysis of alternative compensation rules is relevant regardless of whether one evaluates policy changes on the basis of hypothetical compensations tests, or on the basis of explicit social welfare functions.

[7]Owen and Braeutigam, p. 30, are among the few writers who have noted that there are alternatives to compensation in money form. They refer to "delay, outright blockage, or alternative concessions."

[8]We recognize that factors other than the need for compensation influence the choice of timing, technique, output level and output type. Our point is that one or all of these elements may be manipulated in order to minimize undesired losses. When this occurs, compensation has been provided, albeit indirectly.

[9]See Goldfarb (1980) for a discussion of compensation mechanisms employed to facilitate deregulation.

[10]We are grateful to Robert S. Goldfarb, who first suggested this point.

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