Volume Title: The Analysis of Public Output

Volume Author/Editor: Julius Margolis, ed.

Volume Publisher: NBER

Volume ISBN: 0-87014-220-8

Volume URL: http://www.nber.org/books/marg70-1

Publication Date: 1970

Chapter Title: Administrative Decision Making and Pricing: Externality and Compensation Analysis Applied

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Chapter URL: http://www.nber.org/chapters/c3352

Chapter pages in book: (p. 115 - 138)

ADMINISTRATIVE DECISION MAKING AND PRICING: EXTERNALITY AND COMPENSATION ANALYSIS APPLIED

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This paper deals with an administrative decision-making and pricing problem which, by itself, is so special as almost to be unique. It involves the prospective interference in the reception of television signals that will result from the construction of the World Trade Center in New York City. Despite its uniqueness, the issues which it poses are common to a much wider class of administrative decision-making and pricing problems. Certain of these are issues which, in the past, have been incompletely analyzed.

The theoretical area into which this prospective television interference problem falls is that of externality analysis. Three general issues are posed: First, how does the stipulation that spillover costs be explicitly recognized influence project design? Although the answer to this is straightforward, that to the next question is somewhat more subtle. Given any project design, what are the allocative efficiency implications of paying compensation for damages? Determination of the optimal policy here requires an extension of the existing theory of externalities to allow for a comparison between what Frank Michelman has referred to as "demoralization costs"[1] on the one hand and the administrative costs of paying compensation on the other. Once the relevant model has been devised, the final question becomes: Under what circumstances are demoralization costs apt to be especially great? A fourth issue, but one which is discussed only very briefly, concerns the "necessity" for centralized review of administrative decision making so as to assure sensitivity to spillover conditions.

NOTE. Research on this paper was supported by a grant from the National Science Foundation. I would like to express my appreciation for comments received from R. M. Cyert and others when I presented an earlier version of this paper at seminars at M.I.T. and the University of Wisconsin.

[1] F. I. Michelman, "Property, Utility, and Fairness: Comments on the Ethical Foundations of 'Just Compensation' Law," *Harvard Law Review*, April 1967, Vol. 80, pp. 1165–1258, especially pp. 1208–1218.

The paper is divided into four parts. First, the nature of the problem and the prevailing institutional realities are briefly summarized. The analytical framework within which to examine spillover conditions of the sort described is then developed in the second section. This framework is applied to the television interference problem in Section III. The conclusions follow in the last section.

I. The World Trade Center Problem and an Administrative Solution

On January 8, 1968, Mayor Lindsay's Advisory Task Force on CATV and Telecommunications (henceforth referred to as the Task Force)[2] submitted an interim report to the Mayor dealing with the problem of television interference posed by the construction of the World Trade Center.[3] The essence of this report, as it bears on the spillover and compensation question, is as follows:[4]

> The World Trade Center, now under construction by the Port of New York Authority, will include twin towers 1,350 feet high. The towers will be erected separately, at an interval of eight months. During part of their construction, the towers will reflect the television signals now transmitted from the Empire State Building. The reflection will . . . cause objectionable interference with television reception in parts of Manhattan and the Bronx. There are conflicting estimates on the number of television homes that will be affected—ranging between 100,000 to 600,000 homes. The interference will commence early in 1970 and will last for at least a year, and perhaps for as much as two years.
>
> When the north tower of the Center is near completion, the broadcasters will make it their regular television transmitting site, with new facilities embodying the latest developments in the state of the art. Once actual transmission from the north tower begins, the objectionable interference is expected to disappear, and the Task Force assumes that thereafter there will be improved television reception in the City.
>
> The Task Force has examined a variety of proposals for the solution

[2] The author served as an economic consultant to the Task Force. Except for references to the Task Force report, the views expressed here are my own and do not necessarily reflect those of the Task Force.

[3] A summary appears in the *New York Times* of January 13, 1968.

[4] The Mayor's Advisory Task Force on CATV and Telecommunications, *A Report on the World Trade Center and Television Reception in New York City*, January 8, 1968, pp. i–ii.

of the problem of objectionable interference. One proposal was that the height of the towers be restricted, but because the City Government can legally neither impose nor enforce such a restriction, it was not considered a solution. In the end, the Task Force found that the only possible solutions are (1) the use of directional transmitters and/or translators and (2) cable television. Neither offers a complete solution.

In particular, as the report goes on to point out, the capability to serve all of the affected areas by cable television does not presently exist and may not by the time the interference develops. In addition, subscription to cable television at prevailing New York City rates costs $60 per year. This is not a negligible expense in any case—especially for the low-income families in Harlem and the Bronx, who are among those expected to be affected. Both by reason of non-availability and cost, therefore, cable was not felt to be an adequate solution to the interference.[5]

The course of action favored by the Task Force, consistent with the legal restrictions facing the city, was that UHF directional transmitters and/or translators be used to bring a "focused" television signal into the affected areas. "The frequencies at which . . . [these] would operate would have to be in the UHF band because there are not enough unused VHF channels [the broadcasting stations already on VHF will continue to transmit at these frequencies, since most of the City and surrounding areas will not experience the objectionable interferences in question] and because directional transmitting equipment for the VHF band is too heavy and too large to mount on the Empire State Building." [6] What is involved, therefore, insofar as the affected areas are concerned, is a shift of frequencies into unused portions of the UHF band, with directional transmitting used to focus the signal and thereby avoid interference.

Unfortunately, however, there are real costs to the public entailed by this solution. For one thing, sets must be able to receive UHF. It is estimated that at the time the objectionable interference first begins 25 per cent of all the television sets in the city will lack an all-channel capability.[7] In addition, the Task Force was advised that an outdoor UHF antenna will be required to receive the directional signal, and "relatively few . . . now have one or are expected to have one by 1970."[8] The estimated cost of the antenna is $10, and for those unable to install their own an additional charge of $12.50

[5] *Ibid.*, pp. ii, 19.
[6] *Ibid.*, p. 14.
[7] *Ibid.*, p. 17.
[8] *Loc. cit.*

will be involved.[9] Thus, even assuming that set replacement is imminent for those lacking an all-channel capability, aggregate costs of from $2 million to $13 million are involved (depending on which estimate of the interference cone is used) if families living in the affected areas are to receive an acceptable directionally transmitted signal.[10]

A constitutional bar prohibits compensation in this instance,[11] which may go far to explain the neglect of these spillover costs in the initial design. As the Task Force Chairman, Fred W. Friendly, observed, the responsibility for considering these spillovers appears to have "fallen between stools." Lest this situation recur in subsequent administrative decision-making situations, he offered the following suggestions in his transmittal letter to the Mayor:[12]

> At the risk of reciting the obvious, I offer a personal observation as one new to the problems of City planning. It seems to me that those who plan a project of large scope, such as the World Trade Center, must always ask themselves how the project will affect the total City—how it will infringe upon the urban environment in which so many millions of us live and work. They must probe the implications of the project for such things as the shape of contiguous parts of the City, traffic and the movement of persons, aviation safety, and the construction of similar projects in other parts of the City—as well as for television reception throughout the City.
>
> Moreover, in a City such as ours, where the activities of its inhabitants are so complex and interdependent, there must be within

[9] *Ibid.*, p. 18.

[10] This is not an exhaustive treatment of the spillovers involved, but is sufficient at least to establish that these are nontrivial in magnitude. Omitted from the estimate are: (1) prorated set replacements costs; (2) interference that extends beyond New York City to affect reception in Connecticut; (3) the opportunity costs of time expended to arrange for the installation of an outdoor antenna (the implicit installation cost assigned to those who install their own is the commercial charge of $12.50, which is obviously an upper bound); (4) the possibility that the outdoor antenna will have usefulness that extends beyond the period of interference. Also neglected is the possibility that, once the antennas are transferred from the Empire State Building to the World Trade Center, improved reception in much of the city is expected. But perhaps 400,000 homes will find it necessary to reorient outdoor receiving antennas (at a cost of $7.50 each) at that time also (*ibid.*, p. 11). Ideally, all of these factors are taken account of in the building design; but for our purposes here only the transitional signal interference problem will be considered.

[11] This was the interpretation of counsel to the Task Force of terms in the New York State Constitution.

[12] Letter from Fred W. Friendly to the Honorable John V. Lindsay, January 8, 1968, p. 3.

our system of public administration a single focus empowered to look at and to weigh, one against the other, all the implications of a large project. It may well be that the sum total of the adverse implications will require that a project be shaped differently, or perhaps even abandoned, whereas no single negative, looked at in isolation, would have this weight. In the case of the World Trade Center, authority has fallen between so many stools—the City, the States of New York and New Jersey, and two separate agencies of the Federal Government—that no single body has been able to assume aggregate responsibility for this task.

II. Efficiency and Demoralization Costs

An efficiency framework for deciding whether to compensate spillovers is developed in Part 1 of this section. Distributional considerations are introduced in Part 2.

1. Demoralization Costs

As indicated previously, the concept of demoralization costs introduced here is attributable to Frank Michelman. It refers to secondary or adaptive responses taken by those who are made subject to what they regard as capricious redistributions. Secondary adjustments of two types are distinguished: protective and aggressive responses. Protective responses involve asset reallocations by members of society (not necessarily or exclusively the victims) who, observing the circumstances of capricious redistribution, are anxious to forestall a similar fate. These reallocations are induced solely by the failure of compensation to be paid on spillover costs experienced in a nonmarket transaction, and force owners of human or nonhuman assets to accept lower returns than they could otherwise obtain. Aggressive adaptations take the form of disruptive acts against society. In response to what is regarded as a willful destruction of asset values, the victims and their sympathizers respond in kind.[13] Although adaptive responses

[13] A third type of adaptive response not mentioned by Michelman might be characterized as "despondency." This is demoralization of an extreme sort: productive activity on the part of losers and their sympathizers is substantially reduced, and the responsibility for their care may be turned over to the state. For our purposes here, only adaptive responses of the protective or aggressive varieties will be treated in the text.

of both types have been noted previously,[14] they appear not to have received the systematic treatment that Michelman supplies.

Our purpose in the remainder of this part will be (1) to generalize the Michelman model and develop the allocative efficiency criteria for determining when compensation should be paid; and (2) *to make evident the reasons why, even when a project is "optimally" designed, failure to pay compensation can give rise to an allocatively inefficient result.*[15] The analysis proceeds on the assumption that allocative efficiency and income distribution objectives can be meaningfully separated, an aspect of the argument that is examined more thoroughly in Part 2 below.

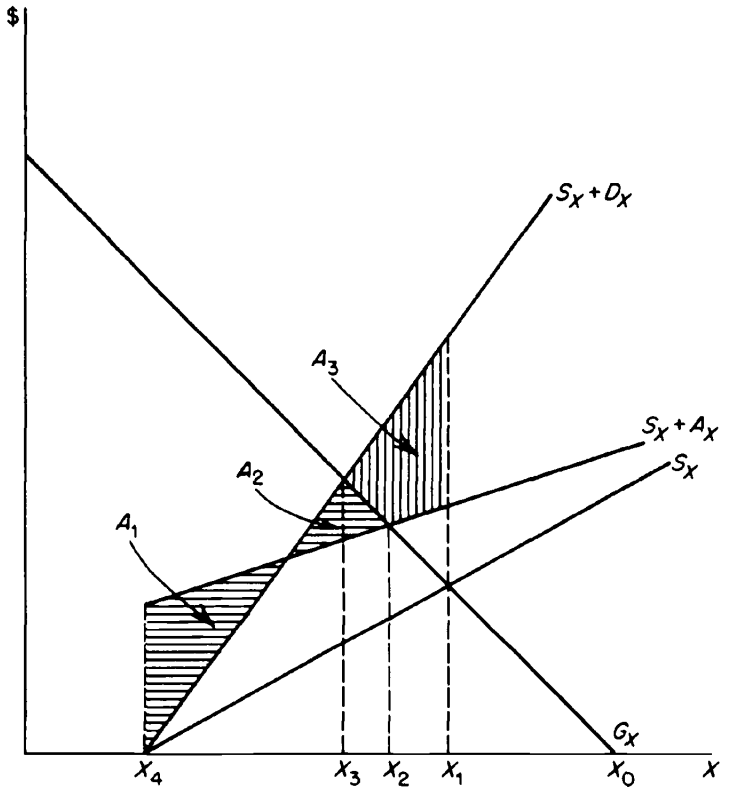
Let the scale of a project be given by X; let $G(X)$ be the benefits accruing from the project less the direct costs, $S(X)$ be the assessed value of the spillover costs if compensation for the full amount of the losses is paid, $D(X)$ be the demoralization costs (which, as indicated above, are the secondary responses induced in "uncompensated losers, their sympathizers, and other observers disturbed by the thought that they themselves may be subjected to similar treatment on some other occasion")[16] that are incurred if compensation is not paid, and $A(X)$

[14] With regard to protective adaptive responses to uncompensated spillovers, see O. E. Williamson, D. G. Olson, and August Ralston, "Externalities, Insurance, and Disability Analysis," *Economica,* August 1967, Vol. 34, pp. 240–41, 243. In some respects, the model appearing in this paper is merely a simple extension of that developed in the paper just cited. But the present version is more complete in its statement of motivational assumptions, has greater generality, and develops the rule-making implications of the analysis in a way that was not apparent to us at the time the *Economica* paper was written. The possibility of aggressive adaptive response is referred to in a footnote by Jerome Rothenberg, *The Measurement of Social Welfare,* Englewood Cliffs, N.J., 1963, pp. 74–75, fn. 25.

[15] I neglect the potential misallocative effects which obtain in small numbers situations when spillover costs are assessed on the agent responsible for the externality but compensation is not paid. An opportunity to arrange a bargain between the parties which shifts the solution away from the social optimum (judged in allocative efficiency terms) exists in principle in these circumstances. (See J. M. Buchanan and W. C. Stubblebine, "Externality," *Economica,* November 1962, Vol. 29, pp. 381–83.) I would not judge this to be a significant factor in practice.

[16] Michelman, *op. cit.,* p. 1214. Note that what I treat as demoralization costs is different from Michelman. He also includes what might be characterized as the immediate experience of disutility borne by losers from the realization that no compensation will be paid. This is the spillover cost term in my model. Absent secondary effects (or effects of the sort mentioned in footnote 15, *supra*), there would be no necessity for compensation in order to reach an allocatively efficient result—although, of course, design size should reflect all costs, including spillovers.

FIGURE 1



be the administrative costs of determining who is adversely affected and to what extent. Assume that if compensation is paid at all that it is paid in the exact amount of the loss experienced. Then the welfare function can be expressed as:

$$(1) \qquad V = G(X) - S(X) - \min \{D(X), A(X)\},$$

and the objective is to choose the optimum project scale so as to maximize V.[17] This can be shown graphically in Figure 1. Assuming

[17] For simplicity of exposition, and so as to focus better on the demoralization cost issue of principal concern to us here, the argument has been simplified by omitting two essential aspects of the problem. Thus, whereas we optimize only with respect to the scale of operations and the decision as to whether or not to compensate, we should also be sensitive to (1) the mode as well as the scale of operations and (2) the possibility that spillover can be efficiently mitigated by taking adaptive action. Implicit in the above formulation is an assumption that

that all costs manifest themselves as marginal rather than lump sum values, and treating $S_X + D_X$ and $S_X + A_X$ as vertical summations of the corresponding marginal terms, this can be interpreted as follows:

The optimum facility size in the absence of external effects is X_0. Given the spillover costs shown by S_X, however, externalities begin to take effect at output X_4, the marginal value of which costs increase monotonically with project size. In the absence of demoralization costs, or if the administrative costs of paying compensation were negligible (and compensation were actually paid), the optimum facility size would be X_1. Given positive demoralization costs and administrative expense, however, the size must be reduced to X_2 or X_3 for the facility to be optimally designed. Whether X_2 is to be preferred over X_3 depends on the comparison of over-all net gain, which can be judged by the reference to the areas designated A_1 and A_2.[18] If A_1

the system has been optimized in both of these latter two respects. Although the decision of whether or not to compensate sets up incentives such that adjustment with respect to one of these dimensions will be induced, intervention is necessary to secure simultaneous satisfaction with respect to both (assuming that bilateral bargaining is not feasible).

Thus, if compensation is not to be paid, those who sustain the spillover will have the incentive to adapt against it. Expressing adaptation expense as Z, their objective, for any given value of X, is to choose Z so as to minimize $S'(X, Z) + Z$, where $\partial S'/\partial Z < 0$. If compensation is to be paid, and if spillover varies with the mode as well as the scale of operations, those who are responsible for the project will naturally be sensitive to both mode and scale in its design. In the absence of instructions to the contrary, however (or unless social welfare considerations reliably prevail), this incentive to select the optimal mode vanishes if compensation is not required. Those who are responsible for the spillover may be expected to choose instead the mode that maximized direct net benefits alone: "excessive" spillover costs are thus apt to be generated. Likewise, the decision to pay compensation attenuates the incentive of those who experience the spillover to adapt efficiently against it. A potential breakdown of incentives thus exists whichever way the compensation decision is made. It should therefore be stipulated that (1) if compensation is to be paid, damages will be assessed in the amount necessary to restore wealth to a *status quo ex ante* condition "as if" adaptation against spillover has been made, and (2) if compensation is not to be paid, those who are imposing the externality will be required to select the optimal mode anyway.

For a discussion of these issues in the context of compensation for accidents, see Williamson, Olson, and Ralston, *op. cit.*, pp. 237–39. Also see Ronald Coase, "The Problem of Social Cost," *Journal of Law and Economics*, October 1960, Vol. 3, pp. 41–42.

[18] The total net benefit of operating at X_2 and paying compensation is given by the area between G_X and $S_X + A_X$ from the origin to X_2. The total net benefit of operating at X_3 and not paying compensation is given by the area between G_X and $S_X + D_X$ from the origin to X_3.

To see that A_1 and A_2 are the relevant areas, let A_2' be that part of the shaded area A_2 to the left of X_3 and A_2'' be that part of A_2 to the right of X_3. Now if

exceeds A_2, compensation should not (on allocative-efficiency grounds) be paid and project size should be limited to X_3. If instead A_1 is less than A_2, compensation should be paid and the facility should be extended to size X_2. (Obviously if the curve $S_X + D_X$ and the curve $S_X + A_X$ are nonintersecting over the relevant region, one always selects the lower of the curves as the appropriate one for determining optimum facility size, and compensates or not accordingly.)

Note that if the facility is mistakenly designed to size X_1 (or larger), the area A_3 (or its counterpart if X exceeds X_1) also needs to be considered in making the decision on whether or not to compensate. The criterion here is compensate if $A_2 + A_3$ is greater than A_1, otherwise not. More generally, the following proposition is advanced: whatever the facility size, if the redistributive consequences of an activity can be expected to induce secondary responses, failure to allow for such adaptations can lead to an allocatively inefficient compensation policy. Contrast this with the more common proposition that once facility size is fixed and its immediate spillover consequences established, the question of whether or not to compensate involves only equity but not allocative considerations. But clearly more than a simple transfer payment is involved if nontrivial administrative costs will be incurred in paying compensation, and/or if protective or aggressive adaptive responses to noncompensation are reasonably probable.[19]

It might be protested that this is all well and good, but that it is equity, not efficiency, that really matters. The vital issue is "what

the facility were built to size X_3, the region A_1 would represent costs which could be avoided by not paying compensation, while the area A_2' would be avoidable costs if compensation were paid. All other costs are the same, whatever the compensation decision. Since the benefits, given by the area under G_X from the origin to X_3, are identical in both cases, the choice rests on the relation of A_1 to A_2': if A_2' is greater than A_1 compensate, otherwise not.

The analysis is incomplete, however, because if the decision is made to compensate, the optimal size is X_2 not X_3. If the size of the facility is extended from X_3 *to* X_2 under the stipulation that compensation will be paid, the additional net benefit A_2'' will be realized. Thus the complete criterion is: if $A_2(= A_2' + A_2'')$ is greater than A_1 operate at X_2 and compensate; otherwise operate at X_3 and do not compensate.

[19] Uncompensated pecuniary spillovers might also give rise to secondary adaptive responses which have allocative effects. Relevant in this connection is Burton Weisbrod's comment on Anthony Downs' paper. Weisbrod points out that many of the spillovers identified by Downs are pecuniary but not real. This may be correct in terms of immediate consequences. But despite his principal emphasis on fairness rather than efficiency, Downs is expressly concerned that noncompensation may induce aggressive adaptive responses—which is an efficiency aspect of the problem.

ought to be done?"; the above is merely a digression. But this misses the point. What ought to be done cannot be judged without considering the cost implications. Otherwise, presumably, we would always compensate—a rule which, manifestly, society has rejected. An analytical framework is evidently needed to explain this condition. The above analysis organizes the issues in a way which, if it does not fully dispose of the compensation question, at least reveals the tradeoffs.

The model can be extended to allow for the possibility of "imperfect" compensation. Thus, let Y be the degree of precision in compensation attempted (where, say, Y is the coefficient of variation in compensation paid, and a value of $Y = 0$ reflects exact compensation in the precise amount of the damage inflicted).[20] Obviously, the administrative cost of ascertaining compensation increases as Y decreases. It also seems plausible to assume that demoralization costs are an increasing function of Y—either because of risk aversion or because, when precise compensation is paid, it is evident that society is earnestly concerned over redressing damages imposed. Both protective secondary investments and aggressive secondary responses are therefore apt to be an increasing function of Y. Thus the model becomes

$$V = G(X) - S(X) - [D(X, Y) + A(X, Y)], \tag{2}$$

and the purpose now is to select X and Y optimally so as to obtain an allocatively efficient solution. The maximization is again straightforward, the difference being that X and Y are now determined simultaneously, whereas previously Y was arbitrarily set equal to zero. In the absence of relatively large fixed administrative expenses (expressed in relation to the extent of demoralization anticipated if no compensation is paid), compensation (however imperfect) would become usual on every occasion of spillover. Also note that only if D and A are additively separable in X and Y will the optimum design size always be independent of the degree of precision in compensation attempted.

Consider now the circumstances under which the demoralization costs resulting from the noncompensation of losses occasioned by deliberate social action are apt to be especially great. Assuming that individuals or groups are wealth maximizers, the general proposition

[20] Note that a value of Y greater than zero does not imply an undercompensation bias. It merely reflects a willingness to accept greater variance in the estimate of losses.

is this: individuals or groups who (a) either bear or observe the conditions of spillover and (b) can reasonably expect that they will be similarly disadvantaged in the future have an incentive to adapt in ways that are calculated to discourage the repetition or attenuate the effects of similar administrative decisions made subsequently. Within this framework, the following criteria are advanced as a basis by which to judge when to compensate. *Ceteris paribus,* demoralization costs increase, and thus the case for compensation becomes stronger, as any of the following happen.[21]

1. THE PURPOSIVENESS OF THE ACT AND THE FORESEEABILITY OF ITS CONSEQUENCES INCREASES. The criterion is based on the assumption that disadvantaged individuals are apt to feel especially aggrieved, and hence most apt to adapt against the possibility of being made to bear such spillover costs at some future date, if it can reasonably be inferred that they are being deliberately exploited. The calculated choice to impose spillover costs thus has special counterproductive potency. Unanticipated spillovers, by contrast, are regarded as essentially random occurrences. The individuals experiencing such spillovers have less cause for believing that they are being discriminated against, and hence have less incentive to forestall subsequent spillovers by adapting against such contingencies.

2. THE MORE EVIDENT IT IS THAT THE ADMINISTRATIVE COSTS OF SECURING SETTLEMENT ARE LOW. The assumption here is that disadvantaged individuals have an appreciation for the real costs that would be imposed on the state by the stipulation that all spillovers, however trifling, be compensated. When it is evident, however, that the administrative costs of securing settlement are low, failure to pay compensation encourages those who bear the spillover

[21] The first five criteria are substantially those proposed by Michelman (*op. cit.*, pp. 1217–18, 1223). The rationale supplied in each case is mine.

Note that Peter Steiner, in his comment on this paper, contends that "These criteria are not derived from the theory of demoralization costs." This is true. But demoralization cost theory is merely intended as a means by which to organize the issues and relate this important concept to conventional externality theory. The criteria for judging when demoralization costs are apt to be especially great are all derivable from the simple (wealth maximizing) proposition that people are more prone to adapt when the subjective probability of otherwise being exploited is perceived to be high. This is, I assume, at least reasonable if not obvious.

to believe that their property rights have little standing. Hence they are inclined to adapt (protectively or aggressively) accordingly.[22]

3. THE GREATER THE HARM EXPERIENCED. When, either individually or collectively, the harm experienced is large, individuals and groups who bear the spillover are apt to regard the case for compensation to be especially great. The assumption of decreasing marginal utility of money would tend to support claims of compensation whenever any individual experiences substantial harm. Spillovers that are individually small but collectively great, especially if they fall disproportionately on a well-defined minority group in the population, tend to encourage the view that the group's interests are being subordinated under the prevailing administrative decision-making process. Hence the inclination to adapt.

4. THE LOWER THE "SIMPLE" NET GAINS [G(X)] THAT THE PROJECT PRODUCES. The approval of projects for which the "simple" net gain is small suggests that either special interests or extra-economic considerations have been accorded great weight. Had the relevant spillover costs been included, the project might well have failed to pass the usual economic tests. Again, the apparent subordination of the interests of disadvantaged parties is what stimulates the adaptive responses.[23]

5. THE LESS EXTENSIVE IS THE PARTICIPATION IN THE BENEFITS OF THE PROJECT BY THOSE WHO EXPERIENCE THE EXTERNALITY. Circumstances for which evident reciprocities between burden and benefit are lacking are ones which, in the absence of compensation, suggest exploitation of the disadvantaged parties. Adaptive

[22] Even if adaptive responses by individuals were independent of the administrative costs of settling claims, the case for compensation becomes stronger as administrative costs decline. This follows directly from an examination of equation 1 and Figure 1 above.

[23] Kenneth Arrow raised a question at the conference over this criterion. He suggested that disadvantaged parties might feel especially aggrieved if, for a project that had enormous net gains (and hence, presumably, the capacity easily to pay existed), compensation was refused. The point has merit and deserves to be investigated. Possibly the relationship between compensation and "simple" net gains is U-shaped.

An additional justification for requiring compensation for marginal projects is that such a rule would serve to discourage the uneconomic expenditure of society's resources. Whatever the merits of this judgment, it does not bear directly on the demoralization question per se.

responses calculated to avoid such results in the future are thus encouraged.

6. THE GREATER THE EXTENT TO WHICH THE DISADVANTAGED GROUP HAS PRE-EXISTING GRIEVANCES (BY REASON OF HAVING BEEN MADE TO BEAR SPILLOVER COSTS IN THE PAST) AGAINST THE STATE.[24] This criterion moves beyond the consideration of the project taken by itself to consider expected net consequences over a series of programs. A group that is disadvantaged in one case, favored in another, unaffected in a third instance, etc., may regard the administrative decision-making calculus as one which, in a composite sense, is "fair." Groups, however, who find themselves systematically disadvantaged have a strong incentive to reduce their exposure to exploitation.

Since it is costly to apply the above analysis in individual cases to determine whether, on *every* occasion of spillover, demoralization costs are greater than or less than settlement costs, it may be efficient to develop some crude organizing principles ("rules of thumb"). One that is commonly recognized by the law is that whenever there is physical invasion, however small the cost, compensation shall be paid.[25] The reasoning here, presumably, is that the physical taking of property represents a general threat to secure expectations. Hence, however trifling the infringement, compensation is paid. A second rule to deal with situations (such as the case examined above) where physical invasion is absent might involve a threshold specification. Whenever the expected aggregate loss or whenever any individual loss exceeds some specified set of values, the spillover will have its demoralization and administrative costs evaluated. A third would be to give special consideration to compensation in cases involving previously disadvantaged and aggrieved parties. (Note, however, that it is probably easier for administrators than for the courts to put such a rule into effect. For continuing programs involving high exposure to

[24] With respect to each criterion, but perhaps especially criterion 6, one would expect, *ceteris paribus*, that the probability of aggressive reaction would vary directly with the degree to which the affected group perceives that the community is sympathetic to its grievances; grievances that have "legitimacy" in this sense will, if acted upon, be less vigorously repressed by the exercise of police powers by the state. Such grievances, eventually, may lead to a legislative correction if the violation of rights persists.

[25] As Michelman points out, the courts "*never* deny compensation for a physical takeover. . . . This may be true although the invasion is practically trifling from the owner's point of view: a marginally encroaching sidewalk, for example" (*op. cit.*, pp. 1184–85).

loss of previously disadvantaged parties, legislative action to provide explicitly for compensation may be warranted.[26]) Doubtlessly other "efficient" rules would emerge as experience in implementing the model proposed is accumulated.

2. *Distributional Considerations*

Objections to analyses of the above type can and have been made on grounds that it is inappropriate to separate allocative efficiency from income distribution.[27] This is fundamentally correct. In every allocative efficiency judgment for which a redistribution is involved there exists an implicit distributional weighting: usually, that the benefits and costs are weighted equally "to whomsoever they may accrue." This might seem to be an insufficiently refined assumption, especially if one is inclined to the view that "The determination of prevailing values for a given community . . . is a proper and necessary task for the economist."[28] Unfortunately, however, the procedures by which the economist is expected to respond to this injunction and operate upon it are not provided.[29] It is, perhaps, instructive to note that, immediately following the statement quoted above, Bergson goes on to state that the necessary value-determination process "is a project which I shall not undertake here."[30]

Lacking a specification of community values, can a case for the above analysis, with its emphasis on allocative efficiency, nevertheless be made? At least three arguments suggest themselves. First, for

[26] Michelman also recognizes the difficulties that the courts experience with such cases, and suggests that legislative remedies may be appropriate where the conditions of such spillover occur repeatedly (*op. cit.*, pp. 1254–56).

[27] See, for example, Rothenberg, *op. cit.*, pp. 100–103, and references cited therein.

[28] Abram Bergson, "A Reformulation of Certain Aspects of Welfare Economics," *Quarterly Journal of Economics*, February 1938, Vol. 52, p. 323.

[29] An approach that has recently been proposed that has promise is the treatment of distributional questions at a rule-making (constitutional) level. On this see J. M. Buchanan and Gordon Tullock, *The Calculus of Consent*, Ann Arbor, Michigan, 1963, Ch. 6; Harvey Leibenstein, "Long-run Welfare Criteria," in Julius Margolis (ed.), *The Public Economy of Urban Communities*, Baltimore, Maryland, 1965, pp. 39–51; Michelman, *op. cit.*, 1218–24. Conceivably the law can evolve appropriate rules by framing the distributional issue in a repeated play context of this sort, but for this one would expect that the allocative efficiency framework developed above can be used as input to such a process. Indeed, as Michelman points out, "we shall find ourselves asking much the same questions to determine whether a compensability decision is fair as were suggested by the [allocative efficiency] approach" (*op. cit.*, p. 1223).

[30] Bergson, *op. cit.*, p. 323.

purposes of illustrating the *general* properties of the model, any distributional assumption will do. (For example, the functions and curves could be interpreted as ones which already embed the appropriate distributional weights.) The same types of implications with respect to a treatment of externalities will obtain.[31] Second, if one assumes that the political process has already "solved" the distributional problem, one might take the position that, subject to the condition that the movements involved are small, neutrality at the margin is appropriate.

Third, whether distribution is "correct" or not, it may be impolitic to employ any valuation scheme other than one which, in the first instance at least, weights benefits and losses equally. It should be noted, however, that to proceed in this way does not, if demoralization costs are introduced in the way suggested above, suppress distributional considerations entirely. Thus whether a program or set of rules is apt to have serious secondary consequences is a function of *who* the affected parties are. Hence, even within what is conceived of as an allocative efficiency framework, distributional considerations can manifest themselves in at least a limited way.

If, as seems plausible, the very rich are the ones most apt to make asset reallocations in response to uncompensated spillovers, while the poor will be most ready to engage in aggressive behavior, the broad middle class may be the group least compensated under these rules. This may appear inequitable, and a remedy therefore indicated. Such, however, moves outside the allocative efficiency framework herein developed. Constitutional questions of fairness are involved.

III. Application to the World Trade Center

My first purpose will be to indicate what appear to be the properties of the World Trade Center design under the prevailing institutional arrangements. Given this design (and assuming away for the moment the constitutional bar to compensation), the proposed criteria by which to judge when demoralization costs are apt to be especially great are successively applied to the television interference problem. Finally, the centralized versus decentralized decision-making problem is briefly considered.

[31] An exception might be noted. If, under the prevailing social value system, no uncompensated spillovers are admissible, the demoralization cost expression vanishes. Here, optimality always occurs at X_2 (where $S_X + A_X$ intersects G_X), and compensation is always paid.

1. The World Trade Center Design

Inasmuch as the television interference effects (and possible other height-related spillovers—e.g., air traffic interference) apparently were not considered when the Center was designed, the value of X_0 on Figure 1 presumably reflects the design height selected of 1,350 feet. The value of X_4 represents the height at which interference first becomes significant, namely 900 feet, and X_2 or X_3 is the optimal facility size.[32] Which of these two values is allocatively the most efficient depends on a comparison of administrative and demoralization costs. Are there genuine secondary effects to be concerned over, and are the administrative costs of paying compensation too great as to justify bearing them?[33]

2. The Criteria Applied

Consider criterion 1: the purposiveness of the act and the foreseeability of its consequences. There is no question that the World Trade

[32] "There is general agreement that if the towers were to rise no higher [than 900 feet] there would be no objectionable interference with television reception in New York City" (Task Force, *op. cit.*, p. 12). There is at least a possibility that were the Port Authority even now presented with the requirement that compensation be paid for interference created, redesign might still occur—although this is perhaps doubtful. Inasmuch as the estimated cost of the World Wide Trade Center is $575 million (*ibid.*, p. 4), redesign might be prohibitively expensive.

[33] Peter Steiner, in his comment on this paper, poses the question: Is the concept of demoralization costs operational? My numerous references to Michelman's fundamental examination of this question (*op. cit.*) did not, apparently, satisfy him. The answer that emerges from my reading of Michelman is that demoralization costs have long played an implicit role in the development of compensation law, but that the law has suffered from the lack of an explication of this concept. Michelman's purpose and mine is to correct this condition by providing the relevant organizing framework.

That demoralization costs can be interpreted as an extension to conventional externality analysis must be regarded as a distinct gain. Although the economics profession long questioned the operationality and empirical significance of the externalities concept, I would judge that this has been resolved affirmatively in both respects. Recent refinements and applications of the theory have contributed to this result. Subsequent refinement and experience with the demoralization cost concept should improve its power also.

Even without these, and confining attention to the papers reported in this volume, the concept has relevance that extends beyond the World Trade Center situation. It can also be brought to bear on the uncompensated urban highway and urban renewal spillovers examined by Downs.

Center construction is deliberate, and even if only at a late stage the extent of its spillover effects became apparent, design changes might still have been made—albeit that the city could not itself require these. Thus criterion 1 is satisfied in large measure.

Criterion 2 is concerned with the administrative costs of securing settlement. Is it realistic to expect in this instance that the identity of and effect on disadvantaged parties can be determined at low cost? With respect to the identity question, it must be conceded that genuine differences exist. Two engineering studies sponsored by the Port Authority indicate that the cone of objectionable interference will be 3 to 5 degrees wide, while a third study places the cone at 30 degrees. Which of these is more nearly correct will obviously affect the optimal design. But it should nevertheless be possible to establish objectively—e.g., with a test set brought into each neighborhood—the extent of interference experienced *ex post*. Such an approach would be consistent with the objective observer standard proposed by Michelman.[34] Also, it should be noted, *precise* satisfaction of every claim is not necessary for compensation to be effective. A combination of an objective test of interference with an "average" compensation payment would seem in this instance sufficient to drive administrative costs to relatively low levels.[35]

With respect to criterion 3, the extent of harm experienced, there is ample reason for regarding a spillover of from $2 million to $13 million as serious. As the Task Force puts it "there is no doubt that the television set is a constant source of professional entertainment and a constant window on the significant events that occur in the nation and throughout the world. This is particularly true for those who live in the deprived sections of northern Manhattan and the Bronx, which will lie directly in the path of the cone of objectionable interference caused by the construction of the twin towers of the World

[34] Michelman's objective observer loss-estimation standard is that which we would "impute to ordinarily cognizant and sensitive members of society" (*op. cit.*, pp. 1215–16). Otherwise estimation is apt to degenerate into a gaming relationship.

[35] As the extended version of the model makes clear, compensation is better regarded as a matter of precision than in either-or terms. As indicated in the text, if the administrative expense of paying compensation is subject to a large fixed cost, optimal compensation may be to pay nothing; but generally, where significant secondary responses can be anticipated, compensation to victims in an amount equal to the expected value of the loss would appear indicated. The degree of precision attempted turns not on the mean compensation paid, but on the deviation in the value of actual loss from estimated.

Trade Center."[36] Those who experience the interference will therefore make the expenditures necessary to receive the directional UHF signals or, lacking resources, will be denied an important source of satisfaction.[37]

Criterion 4 deals with the intrinsic merit of the project. There are those who insist that the World Trade Center is even lacking in this respect. I will assume for our purposes here, however, that it qualifies as a project having positive net gains at design size X_0—at least if spillover costs are neglected.

The primary objectives specified by the Port Authority for the design of the Trade Center are relevant in considering criterion 5. These are: "that the Center serve as a symbol and focus for the interest and involvement of the Port of New York in international trade and commerce; that the Center meet the highest aesthetic standards and be a pleasure to eye and spirit; and that the Center provide ten million square feet of rentable exhibition and office space."[38] Families living in Harlem and the Bronx are not obviously the principal beneficiaries of such an undertaking. Such indirect employment benefits as result would probably obtain for any building providing ten million square feet of useful space. One must conclude that evident reciprocities between burden and benefit are missing.

Finally consider criterion 6—whether substantial numbers of those required to bear the spillover costs have what they regard as preexisting grievances against society, where these have a recognized legitimacy. Families living in the deprived neighborhoods of Harlem and the Bronx almost certainly fulfill the conditions of this criterion.

With the single exception of criterion 4, and possibly even here as well, a consistent reading is obtained on each of the criteria: positive demoralization costs, possibly nontrivial in magnitude, are to be expected if compensation is not paid. Against this must be weighed the administrative costs of paying compensation—which, in this instance, are evidently low. The crude quantitative estimate that

[36] Task Force Report, *op. cit.*, p. 25.

[37] Conceivably the cost of bearing the spillover will be shifted back on the landlords, who will either install the necessary antenna or experience reduced rentals. This, however, I find doubtful. Landlords must be anxious to forestall relocation by their tenants for this to transpire. For one thing, rent controls in New York City may cause landlords to welcome rather than resist decisions to relocate. Furthermore, even in the absence of this issue, threats to relocate may not be viable. The interference is a transitory phenomenon; relocation is an expensive response to it.

[38] Task Force Report, *op. cit.*, p. 3.

emerges, given the apparent order of magnitude difference that separates these two factors, is that compensation is clearly indicated—at least at the design size of 1,350 feet.[39] Whether compensation would continue to be necessary were the building redesigned to take explicit account of the interference costs is unclear. But compensation here involves more than a simple transfer: allocative efficiency considerations reinforce equity arguments in its favor.

Thus, although secondary responses of the protective variety are probably not to be expected in this instance (coaxial cable service may not be available or sufficiently attractive, and this may substantially exhaust the range of "long-term," anticipatory, defensive investment responses to TV signal interference of the type described), the expressed social discontent (aggressive secondary response) is less easy to dismiss. The evidently low administrative expenses that would be incurred in paying compensation would appear to be well below the expected value of the demoralization costs of this reactive type.

3. Centralization versus Decentralization

The inability of the Task Force to require either redesign of the World Trade Center or compensation for damages caused its chairman to propose an alternative administrative decision-making procedure: "there must be within our system of public administration a single focus empowered to look at and to weigh, one against the other, all the implications of a large project." Conceivably the prevailing political and legal realities make this the only feasible solution. The relatively high costs of moving to a centralized decision-making system of this sort should, however, be appreciated.[40]

It could be argued, of course, that the situation described above is not typical. It might be claimed, for example, that ordinarily, when-

[39] Although Steiner agrees with my evaluation that compensation should be paid under the criteria proposed, he indicates that "for some other list, compensation should not be paid." Agreed. Suppose, for example, each of the criteria were replaced by its opposite. The judgment on compensation would then be reversed. But unless Steiner proposes such a change, which I find doubtful, or is explicit on other criteria he has in mind, his observation lacks operational significance.

[40] Some of these are discussed in my "Hierarchical Control and Optimum Firm Size," *Journal of Political Economy*, April 1967, Vol. 75, pp. 123–38. See also Gerald Sirkin, *The Visible Hand: The Fundamentals of Economic Planning*, New York, 1968, Chap. 4.

ever social goals and bureaucratic goals are in conflict, differences are resolved in favor of social goals. But this requires stewardship behavior of an unusual sort. I suggest that it is more realistic instead to recognize that there exists a "bureaucratic cost" counterpart for the term private cost in the usual social cost versus private cost distinction. To proceed on the supposition that spillover costs for which no compensation is required will, nevertheless, be fully reflected in the decision making of public or quasi-public agencies appears, at the very least, to be unnecessarily hazardous.

The preferred economic solution to this (and similar) administrative decision-making problems is to supply the agency with the relevant set of pricing signals. The stipulation that compensation must be paid if demoralization costs can reasonably be expected to exceed the administrative costs of paying compensation should tend to induce *both* superior designs *and* a preferred mix of programs. The above analysis is thus but another example of how, under the appropriate institutional rules, the use of prices can be made to help solve complex economic issues in a decentralized way.[41]

IV. Conclusions

Four principal conclusions emerge. First, with respect to the particular spillover condition examined above, allocative efficiency considerations would appear to support the payment of compensation for the prospective television interference that will result from the World Trade Center construction. This judgment is reinforced by appeals to equity. The failure of compensation to be required in circumstances of this sort strongly suggests that the social decision-making apparatus is defective.

Second, evaluating the efficiency implications of spillovers of the sort considered above requires that the concept of externalities be expanded to include costs which take the form of secondary adaptive responses (demoralization costs). These need to be weighed against the administrative costs of paying compensation. The latter costs are apt to be great, and hence compensation may be prohibitively expensive, if it is stipulated that, whenever compensation is made, damages

[41] The tax implications of this compensation argument would presumably require that it be qualified. An examination of this question is beyond the scope of the present paper.

shall be ascertained exactly. However allowing as we have for "imperfect" compensation restores the likelihood that, absent large fixed administrative expenses, allocative efficiency will support compensation whenever nontrivial secondary responses to spillover conditions are reasonably probable.

Third, although the emphasis throughout has been on allocative efficiency, one should not suppose that an essential conflict with equity exists. As Michelman has observed, the same general criteria as are invoked under an allocative efficiency standard will ordinarily be operative in reaching an equity judgment. This applies not merely to the question of whether to compensate but also to the matter of precision: one would expect that the conditions under which demoralization costs are especially sensitive to the exactitude of compensation would also be ones for which equity demands precision.

Finally, an issue that has been exposed but incompletely examined in the above discussion warrants acknowledgement. This concerns the long-run rule-making implications of the theory, which is the principal interest of the law. To evaluate each case separately would clearly have serious administrative cost implications and would subject decision makers to excessive uncertainty. The law is therefore concerned with the design of policies to deal effectively with general classes of damage exposure in the long-run. If, as appears to be the case, allocative efficiency analysis has reached a higher stage of development than has the evaluation of equity, and if, in addition, the conflict between these two criteria in individual cases is rarely substantial, demoralization cost analysis would appear to have special relevance for the rule-making process. But note in this connection that if interdependencies between rules are significant, effective rule making may require a pre-ordering or simultaneous determination of issues. Development of this aspect of the argument, however, is beyond the scope of this paper.

COMMENT

by PETER O. STEINER, *University of Michigan*

I am flattered by the fact that Williamson, apparently in response to my discussion, has both shortened his paper and revised it in such a way that my major criticisms of his original paper are no longer relevant. I am embarrassed only by the fact that what remains of my discussion paper is so short as to suggest either sloth or acquiescence on my part. The five numbered paragraphs immediately below are what is left of my original comment. Since Williamson chooses to discuss my comments (in his footnotes 33 and 39), I will respond briefly in the last two paragraphs.

(1) I have contemplated the phenomenon known as Oliver Williamson for some time and offer the hypothesis that he is not an individual at all, but rather a committee. This is consistent with his enormous productivity over the last several years, most of which is superb, and also, less flatteringly, with this paper. Here he brings, again with enormous energy and diligence, a large body of theory to bear on the interference caused to the reception of television signals by the construction of the World Trade Center. My complaint is that his appetite has run somewhat ahead of his digestion—that the real data about the policy questions does not support as much apparatus as he brings to bear on them, nor (conversely) is the theory sufficiently original or powerful to be a major contribution in its own right.

(2) The central fact reported by Mayor Lindsay's task force appears to be that the Port of New York Authority is designing and building two towers which will cause massive TV interference to several hundred thousand homes for two years. It is clear that the Authority made its decision without contemplating this adverse effect. Williamson suggests that it is possible (and perhaps likely) that had the Authority been obliged either to avoid the damage or compensate those damaged, it would have redesigned its facility.

(3) The example is interesting in several ways. It provides illustration of the well-known theorem that if a producer does not pay the marginal cost of a resource (in this case, altitude), he is likely to overuse it. Second, it reminds us that the mere fact that the producer

is a public agency provides no protection against a divergence between "private" (i.e., producer's) and social costs. Third, it does so with particular force since the damaged parties are mainly members of relatively underprivileged groups in our society, groups whom we are particularly reluctant to disadvantage further.

(4) All of this is both useful and suggestive. Williamson's interest in the case is twofold. First, as a vehicle for insightful application of Michelman's concept of demoralization cost—a particular form of externality-induced response that may be socially costly. I found the concept of substantial interest in and of itself, but not especially helpful in discussing the World Trade Center. The reason is evident in the maximizing equation. In equation 1 the objective function is given as $V = G(X) - S(X) - \min \{D(X), A(X)\}$. But the essence of the criticism of the Port of New York Authority is not its neglect of the relative sizes of demoralization costs, $D(X)$, compared to the administrative costs of compensation, $A(X)$, but rather its neglect of $S(X)$, the spillover cost. Nothing in the case, as developed, measures or identifies the demoralization costs or gives a clue as to whether this is an operational concept.

(5) Williamson's second major interest is in suggesting rules for when compensation *should* be paid. To the five criteria suggested by Michelman, he adds a sixth. My objection here is not to this list of normative judgments, but to Williamson's apparent failure to realize that it is wholly self-contained. Given this, it follows that compensation ought to be paid in the World Trade Center situation. For some other list, compensation should not be paid. These criteria are not derived from the theory, nor do they enrich it. Williamson has neglected to integrate them into his analysis.

My query in paragraph 4 is not whether demoralization cost is an operational concept, but whether the analysis of the World Trade Center case sheds any light on the operationality of the concept. I believe Williamson has made a contribution in extending and refining Michelman's rather loose concept. Granting this, does his review of the World Trade Center case attempt to measure the size of the demoralization cost, or merely illustrate anecdotally the concept? I continue to believe it is the latter.

My query in paragraph 5 seems so clearly stated that I am astounded that Williamson misses the point in his footnote 39. Suppose I were to say that compensation should be paid whenever (a) those damaged had legally enforceable claims, or (b) had incomes that were below

the national average. These are value judgments that are not without support in our society, but they do not derive from the Michelman-Williamson analysis. Thus they provide an answer to the compensation question that is independent of that analysis. The same is true of Williamson's six criteria.