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# CONCEPTUAL ASPECTS OF FISCAL INTERACTIONS BETWEEN LOCAL GOVERNMENTS AND FEDERALLY-OWNED, HIGH-LEVEL RADIOACTIVE WASTE-ISOLATION FACILITIES*

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# CONCEPTUAL ASPECTS OF FISCAL INTERACTIONS BETWEEN LOCAL GOVERNMENTS AND FEDERALLY OWNED HIGH LEVEL RADIOACTIVE WASTE ISOLATION FACILITIES

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## ABSTRACT

This paper examines a number of ways to transfer revenues between a federally-owned high level radioactive waste isolation facility (hereafter simply, facility) and local governments. Such payments could be used to lessen fiscal disincentives or to provide fiscal incentives for communities to host waste isolation facilities. Two facility characteristics which necessitate these actions are singled out for attention.

First, because the facility is federally owned, it is not liable for state and local taxes and may be viewed by communities as a fiscal liability. Several types of payment plans to correct this deficiency are examined. The major conclusion is that while removal of disincentives or creation of incentives is possible, plans based on "cost compensation" that fail to consider opportunity costs cannot create incentives and are likely to create disincentives.

Second, communities other than that in which the facility is sited may experience costs due to the siting and may, therefore, oppose it. These costs (which also accrue to the host community) arise due to the element of risk which the public generally associates with proximity to the transport and storage of radioactive materials. It is concluded that under certain circumstances compensatory payments are possible, but that measuring these costs will pose difficulty.

# I. INTRODUCTION

This analysis considers the costs that may accrue to a local economy when a large federal facility is sited and seeks to evaluate ways to deal with these costs through the local public sector. In particular, attention is focused on high level nuclear waste isolation facilities. Like many hazardous material handling facilities, the nuclear waste isolation center is viewed as an unattractive addition to a community. For a community to accept such a center willingly, it must feel either that it is compensated in some way for the extraordinary costs it must bear or that it bears an equitable share of a larger set of costs.* One way to compensate communities and to assess the costs of compensation to those who benefit is for the facility to make tax payments to impacted communities. However, current fiscal institutions make it difficult to create tax paying arrangements since the federal government, which will own the waste isolation facilities, is exempt from state and local taxation, including property taxation. Instead, a system of payments-in-lieu-of-taxes (PILOT) or other fiscal relationships may be necessary to compensate communities and make possible equitable siting arrangements.

In general, two types of costs accrue to communities from the siting of a nuclear waste isolation facility and give rise to the need for two types of

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*One frequently hears the equity argument cast in terms of distributing "social bads" to all regions of the U.S. on a negotiated basis. For example, one region may be well suited to storing radioactive waste and may be asked to do so for other regions. It would then become the responsibility of the benefiting regions to accept some equally unattractive activities, such as chemical waste repositories. In this way, no single region would become responsible for more than its just share of noxious enterprise. This arrangement can generate regional equity on a broad basis, but does not solve the problem that it will ultimately be individual communities which must deal with these facilities on a day-to-day basis. The payment plans discussed in this paper are well suited to this latter task.

compensating payments. The first, payments-in-lieu-of-taxes, or PILOT, results from the tax exempt nature of the federal facility. They are commonly justified on the grounds that the federal government has a responsibility to "pay-its-own-way" when it acts as a "public marketeer."* Interpretations of fiscal liability range from paying the marginal costs of public service additions to considering the opportunity costs of revenues foregone. This latter argument is particularly germane since in the case of the nuclear waste facility, the dedication of the site to tax exempt use is permanent for all practical purposes. Most studies of federal liability in similar circumstances have attempted to apply the opportunity cost principle in one form or another (see, for example, Williams, 1955; Balk, 1971; and Quigley and Schmenner, 1975). The federal government, however, has usually been unwilling to accept a "tax-like" obligation, particularly one that municipalities could modify by manipulation of their tax rates (Raimondo, 1980), such as would occur, for example, under the "tax equivalency" format proposed by the ACIR (Ebel and Towles, 1980).†

The second type of payment is made to communities which would not be eligible to receive tax payments if the facility were privately owned, but which experience or perceive costs through the facility's presence. Such costs may be described as external (externalities), since they accrue to communities apart from the facility. They are, however, quite important for waste isolation facilities since communities may view these "perceived" or "potential" costs as more damaging than such measurable social "bads" as air or noise pollution. In fact, some might

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*The Federal Government acts as a public marketeer when it produces goods which could have been produced in the private sector. If it does not bear responsibility for all costs of its activity, it will have an advantage over other private activities which leads to distortions in the quantities of good produced. Recently, arguing on equity grounds, the Advisory Commission on Intergovernmental Relations has suggested that the same liability should attend all public goods production (Ebel and Towles, 1980).

†The operational aspects of payments-in-lieu-of-taxes under this format will be taken up in a later paper. See D. J. Bjornstad and E. Goss, "Measuring the Impacts of Using Payments in Lieu of Taxes to Compensate Communities When Siting High-Level, Nuclear Waste Isolation Facilities," Oak Ridge National Laboratory, forthcoming.

argue that the existence of these extraordinary costs (referred to, hereafter, as risks) alone justify placing facilities of this type in the public sector. To the extent this is true, the development of specialized federal-local relationships may be necessary to ensure local cooperation in the siting process.*

This paper reports on progress made in addressing the issues which underlie an understanding of these relationships. In the conduct of this analysis, a simple model of the local economy is developed and used to analyze the choices which a community must make in the provision of public and private goods. Following this, the model is applied to the PILOT question. Next, a general discussion of externalities and tax/subsidy schemes is presented and the options analyzed through the local economic model. In the final section, a summary is given and the course of future work is briefly outlined.

## II. A SIMPLE MODEL OF PUBLIC/PRIVATE GOODS

Assume a local economy that makes choices between the consumption of two commodities: private goods and local public goods. Private goods are measured as the disposable (after tax) income streams emanating from the local household and business sectors. Local public goods are also measured in dollar terms as local public expenditures and are purchased by giving up private goods. We assume that local public goods do not exhibit the same joint supply characteristics as pure public goods. Increasing the number of local residents, therefore, requires proportionate increases of local public goods to maintain per capita levels of satisfaction. The primary distinction between private goods and local public goods is that while private goods are financed through a price system, local public goods are financed through a tax on income which is applied equally on each household and

*Costs due to risk accrue to host communities as well as to neighboring communities and to this extent characterizing them as external is a bit misleading. One might argue that if a community chooses to host a waste isolation facility, these costs must have been overcome, perhaps by choosing the size of the in-lieu-of-tax payments to compensate for risks as well as opportunity costs.

business unit. In evaluating the trade off between public and private goods, local decision units evaluate private goods foregone through this tax payment. It is convenient to think of local public goods as either a single commodity or as a composite bundle of individual commodities consumed in fixed proportions, to avoid scaling problems in measurement. Given this interpretation and given fixed factor proportions and prices in the production of the public good, the dollar value of the local public good can be equated to the revenue yield of the local tax system, assuming no intergovernmental revenue transfers are paid or received and that the local public budget is in balance.

The decision process through which the communities choose quantities of private and local public goods is illustrated graphically in Fig. 1. The distance $OY_0$ measures the total private goods output (total income) of the community and the potential level of public goods (total public expenditures), which we term potential taxable capacity. The distance $OX_0$ measures actual taxable capacity, the potential level of public goods attainable. Note that when there are no leakages into or out of the system, $OY_0$ and $OX_0$ are equal. When this is so, the tax system correctly measures private sector output, no activity is exempt from taxation, and the community does not export taxes (as by taxing tourists) or import revenues (as through state aid).

The triangle $OY_0X_0$ then represents the set of obtainable combinations of public and private goods and the segment $Y_0X_0$, the set of maximum feasible combinations. If we assume the existence of a community preference function, we can determine equilibrium levels of public and private goods. This is shown in Fig. 2. Given a family of ordinal preference functions $I_i$, the community consumes $OX_1$ unit of public goods and $OY_1$ units of private goods. To obtain this level of public goods, $Y_0Y_1$ private goods must be given up. Thus, given preferences and income, the choice of a level of disposable income and public

expenditure defines a tax rate, which is shown in Fig. 2 as $Y_0Y_1/OY_0$. Economic growth in the community can be shown by parallel shifts in $Y_0X_0$, as is depicted in Fig. 3. Given a series of shifts in $Y_0X_0$, the resulting locus of equilibrium points will describe a ray from the origin implying an assumed unitary income elasticity of demand for public goods.*

It is possible, of course, that the balanced growth portrayed in Fig. 3 will not occur and that private sector income will not be translated into taxable capacity on a one-to-one basis. One goal of communities is to increase taxable capacity relative to income by such devices as the exportation of taxes. This makes public goods cheaper relative to private goods in the sense that to consume one dollar of public goods, less than one dollar of private goods must be given up. When taxable capacity grows less rapidly than private income, public goods become more expensive relative to private goods. This occurs, for example, when industries are given "tax breaks" or when exempt property is placed on the tax roll. Fig. 4 illustrates two polar cases of this type of occurrence. In the first case, if the community can, for example, extend its existing tax system to tourists, ceteris paribus, it shifts its actual taxable capacity level to the right from $OX_0$ to $OX_1$ with no change in private activity. This is referred to as a "pure" change in taxable capacity. Its impact is similar to a matching grant whereby the community will find that by increasing its tax rate on local income, tourists will "match" local dollars at the same rate. In effect, the "price" of local public goods (i.e.,

*This result is derived in most microeconomic textbooks (c.f., Ferguson, 1969). A degree of ambiguity surrounds the interpretation of income growth as depicted in Figure 3, since the collective choice preference function may not exist uniquely (Waldauer, 1973, p. 213, Burkhead and Miner, 1971, pp. 145-171). Recently, the income constraint has been viewed as the income of the median voter and when estimating the parameters of this function, to interpret them as characterizing the demand curve of the median voter (Bergstrom and Goodman, 1973, p. 281 and Ladd, 1975, pp. 145-158). When this is true, the Y-intercept changes only when the income of the median voter changes, i.e., when the community's median family income changes, whereas the X-intercept changes according to changes in the tax status of new or current local activity.

local share of public expenditures) has decreased by the matching rate. The final mix of public and private goods will depend on community preferences, but since each point on $Y_0X_1$ lies above every point on $Y_0X_0$, a welfare gain clearly exists.*

In the second case, a "pure" increase in private activity occurs in the sense that community income grows but taxable capacity does not. This could occur, for example, if a tax exempt industry entered the community. Once again, all points on $Y_1X_0$ lie above $Y_0X_0$, and a total gain in welfare exists. The converse, however, is also possible, and it is quite easy to conceive of circumstances in which $X_1$ would lie to the east of $X_0$ or $Y_1$ to the south of $Y_0$. In each of these latter cases, an unambiguous loss in welfare occurs.

Various elements in this model have proven quite useful in the past for analyzing the impacts of energy facilities on communities. For example, it has been argued (Bjornstad, 1978) that a "pure" change in taxable income (i.e., not accompanied by change in private income) occurs where nuclear power plants are sited. These power stations provide most of their own public services requiring only sewer, water, and road hookups (Bjornstad, 1977). The necessary labor force is small, and thus the change in demand for private sector activities is negligible. At the same time, the high capital-labor ratios characteristic of these industries imply large additions to the community's taxable capacity. Although the tax base considered in that study is real property, rather than income, the siting approximates the pure fiscal capacity change described above.

Because no permanent high level radioactive waste facilities have yet been constructed, there are no actual data with which to measure the impact on

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*It is assumed that the "income" from tourists or other nonlocal activities are indistinguishable from that arising due to local activity. Were this not the case, the community could adopt a set of optimal tax rates to discriminate among revenue sources. In effect, we assume a common tax rate is levied on all activity.

communities of siting these facilities. There is, however, sufficient information available concerning facilities themselves to draw a number of inferences concerning the way they will affect host communities. It is expected that high capital-labor ratios will prevail. Security may well dictate that plant public services be internally provided, and the relatively low level of labor required will minimize the public service impact on the community. On the other hand, the communities where waste sites are likely to be located will be in extremely rural areas. Thus the small absolute change in population could well mean a large percentage change for the community. This condition would necessitate large increases in such public services as schools, sewer capacity, water, roads, and electric lines. Of additional and perhaps highest importance, these facilities are likely to be constructed and operated by the federal government which is exempt from payment of state and local taxes. Successful deployment of this technology may, therefore, depend upon the creation of incentives for communities to host high level waste facilities. As noted above, it simplifies matters to take up the issue of incentives in two stages: (1) the loss of potential tax revenue for host communities; and (2) external costs for other communities. We shall now address these issues sequentially.

## III. INCENTIVES AND DISINCENTIVES DUE TO PAYMENTS-IN-LIEU-OF-TAXES

A number of changes will accompany the siting of a high level waste facility that are relevant to this analysis. First, the level of private sector activity will increase due to the influx of workers to operate the facility. We will omit the impacts of the construction stage for the moment recognizing that although real costs and benefits will accrue in the short term, it is

long-term institutional relationships that are the target of analysis. Assuming the community was in the position shown in Fig. 2 initially, the addition of private sector activity $OY_1$ could cause the average income of the local voter to increase or decrease. The second change concerns the new level of taxable capacity. The precise change would depend on a number of factors. Under balanced growth, proportionate changes in private goods and taxable capacity would occur. Balanced growth, however, would be unlikely. Were the isolation facility privately owned and subject to taxation, one would expect taxable capacity to increase more rapidly than private sector activity.* Because the facility is federally owned and not subject to taxation, taxable capacity can increase only due to growth in the household sector. Prior to the siting, the local voter evaluated a budget constraint which reflected the average taxable status of other citizens and the activities in which they work. To the extent that newcomers have similar incomes to old residents, $OY_0$ will not change. However, federally owned activities are not subject to taxation; taxable capacity will increase only due to new household income. No increase will occur due to business income, and the "price" of public goods relative to private goods will increase as per capita taxable capacity decreases.

To put this into more concrete terms, it is useful to distinguish three cases which are relevant to the waste isolation facility:

Case 1: Private Sector Ownership

Case 2: Public Ownership Without PILOT

Case 3: Public Ownership with PILOT

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*This occurs because localities rely on real property rather than "income" as the tax base. Since waste facilities tend to be capital extensive, a disproportionate shift occurs.

Focusing on Case 1, the impact of the facility on the local public sector will depend largely on the taxable characteristics of the facility. If workers, on average, receive salaries equivalent to those of their counterparts in other local industries, $OY_0$ will not change. To the extent the facility income is large relative to worker income (i.e., that the facility is capital intensive), it is likely that the per capita taxable capacity will rise with the result that the price of public goods, relative to private goods, will decrease.* Figure 5 illustrates this circumstance. Although the final mix of goods will depend upon the "price" elasticity of demand for local public goods of the local voter, it is clear that since all points on $Y_0X_1$ lie above those on $Y_0X_0$, the change is Pareto superior. Thus, the community could leave its tax rate unchanged and enjoy per capita increases in public goods with no loss in private goods or could hold constant the level of public goods and enjoy a higher per capita level of private goods by lowering the tax rate.

The second case occurs under federal ownership when there are no PILOT or other transfers between the facility and the community. In this case also, the per capita level of private goods remains constant, but since newcomers arrive, the per capita level of taxable capacity falls, i.e., $(OX_1 < OX_0)$. This assumes that households brought in by siting the facility do not pay their own way through taxable capacity increases associated with the household alone. This follows from the fact that, on average, households in the community are associated with taxable facilities, i.e., they work in facilities that are subject to taxation. Diagrammatically, we have Figure 6. Again, the price elasticity of the local voter's demand for public services will determine the exact outcome, but to obtain

*Per capita income is calculated by dividing total income by the number of persons in the community and is used here for ease of exposition. Because local public goods are divisible and consumed in fixed proportions, no loss of generality is introduced by this transformation.

the same per capita level of services as prior to the siting, the tax rate must be increased and private goods foregone. Conversely, to enjoy the same level of per capita private services, a lower level of public services must be accepted. In either case, all points on $Y_0X_1$ fall below those in $Y_0X_0$ and a loss in utility occurs.

With regard to the third case, a variety of PILOT schemes exist. On the one hand, the federal government may opt to make payments exactly as if it were eligible for taxation. The payment made to the community would change as the tax rate changes, and the ultimate tax payment would depend upon the price elasticity of the local voter. In this case, the same conclusions drawn with respect to the taxable case would obtain. This is termed the tax equivalence method. A second option would be for the federal government to make a lump sum payment equal to that which would occur if the plants were taxable. This solution would be patterned after option one, but payments would not change as tax rates change; hence, the community would face a different price ratio than under the tax equivalence scheme. This result is shown in Fig. 7.

Note that in this case the government has two options. The first is to make payments which would permit choosing the per capita public-private good bundle originally available as shown in Fig. 7. Under the new price ratio, bundle A will no longer be chosen. The exact bundle to be chosen is indeterminate, but as long as preferences do not change and private goods are normal, the solution will be above and to the left of A.*

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*These conclusions rest upon the assumption of constant preferences. To solve the difficulty of changing preferences, we can assume alternatively that the entrance of new households is distributed such as to leave the typical voter unchanged or that we conduct the analysis holding preferences constant so as to infer whether or not the siting would be accepted by the community before the fact.

The second option is to make lump-sum payments which would permit obtaining the same level of utility as that under the tax equivalency scheme. Under this option the original commodity bundle A would also not be chosen, but for normal preferences, some B which lies to the northwest of A will always be chosen, as can be seen in Fig. 8.

A range of other options is available to the federal government, most of which are predicated on some system of compensating the community for the facility, while preventing the "windfall" gains possible if a tax equivalence model were adopted. In fact, most "cost compensation" approaches can be shown to be specious since they reflect only out-of-pocket costs and neglect the fact that the site might have been used for some other, taxable, purpose. For example, the payment may be based on a limited concept of opportunity cost whereby the chosen payment size is equal to the payment which the lands, occupied by the facility, made prior to acquisition. Such payments implicitly assume that save for the facility, the site would have remained forever vacant. Indeed, basing payments on this concept is equivalent to this since the siting of the waste isolation facility effectively precludes other uses indefinitely.

Another cost compensation device would make payments equal to public service costs due to the facility. This plan overlooks the fact that most local public good expenditures are made on behalf of households rather than industries. If the marginal costs associated with the facility fail to include these, the average tax burden must increase if services are to be maintained. It is also possible that the facility will not represent the highest and best use of the industrial land it will occupy and that other activities would be more favorable in a fiscal sense.

In this case, the tax equivalency method may not truly represent opportunity costs. On the other hand, if windfall gains are an issue, the federal government can make compensatory payments to close the gap $X_1X_0$ in Fig. 7. If such payments are chosen to obtain a new per capita feasible set given by $X_0Y_0$, the community would be exactly compensated by the facility. We term this the per capita equity method. If lump sum payments are made, the federal government would have to decide whether to apply the equal utility or equal revenue concept, as discussed above.

We can now summarize these results in terms of incentives for communities to host federal facilities. If the federal government wishes to compensate local governments on a equal basis with the private sector insofar as local taxes are concerned, it will adopt the tax equivalence scheme suggested by the ACIR. While there exist a number of theoretical nuances separating the tax-rate-based tax equivalence PILOT from the lump sum PILOT, each is Pareto equivalent and each provides the community a positive incentive in the sense that it obtains a Pareto superior position from that prior to the siting. Of the cost compensation schemes, only the per capita equity method proves a neutral incentive. The variety of schemes which measure site revenues prior to acquisition or which measure facility marginal public service costs, will always leave the community on a lower indifference surface than prior to the siting. Siting will succeed in these instances only when the community perceives the benefits of the siting inaccurately or evaluates noneconomic benefits to be greater than economic and noneconomic costs. However, the results obtained thus far assume that the waste facility is in all ways comparable to a private facility. If indeed these facilities are characterized by external costs due to risk, the conclusions just stated are incomplete. It is to the consideration of these external costs which we now turn.

## IV. CREATING INCENTIVES TO OVERCOME RISKS

The analysis just conducted assumes that waste isolation facilities are in all ways comparable to privately owned facilities, save for their exemption from state and local taxes. An important reason that such facilities may be federally operated, nowever, is that the public generally perceives that facilities handling hazardous materials, particularly nuclear materials, generate extraordinary costs that exceed those of normal industrial enterprise. Since these costs fall on communities outside the host jurisdiction (and also on the host jurisdiction) they can be treated as external costs. Because the federal government can cut across state and local boundaries in dealing with these costs and because it can be held more completely responsible for these and other potential costs than the private sector, it is the logical body to operate this type of facility.

The existence of externalities is sufficient to justify payments to compensate for external costs due to risks. It is also possible that communities outside the host jurisdiction may influence the siting decision and in this way force the facility to address this cost issue. In this case, there is motivation for the waste isolation facility to internalize these costs through a new set of fiscal relationships which will provide compensation to impacted communities apart from the host jurisdiction. This section analyzes the characteristics of such relationships.

To begin with, we must clarify the nature of external costs and benefits. Formally, externalities are said to arise when a transaction or activity by one or more parties caused benefits or costs to accrue to some third party apart from the original transaction. If one household sprays mosquitos which bite members of other households in the neighborhood, the affected neighbors would receive a benefit for which no charge would be levied. Contrariwise, if the spraying

household lays down such a noxious fog of chemicals that the neighbors' vegetation is killed or stunted, an external cost would be generated. The important point is that, in each case, the fact that third party preferences are not taken into account leads to the production of levels of goods that are not socially optimal. In the case of an external benefit, it can be shown that social benefit (and therefore demand) exceeds private benefit and that the good in question will be underproduced. For the external cost case, the opposite occurs. Since the entity producing the good does not bear the full costs of its actions, the good in question is overproduced.

A rather extensive literature exists that describes remedies to the externality problem. Ronald Coase (1960) has shown that where affected parties bargain, the external cost or benefit may be internalized and optimality achieved. Some, however, fault the Coasian solution because of free rider problems and the lack of access to capital markets faced by many of the affected individuals. These economists often argue for a system of per unit taxes on pollutant outputs and corresponding payments to those suffering from pollutant costs. Although there is no final resolution to this debate, we will focus on the tax and transfer mechanism because of its appeal to equity and its positive impact on reducing opposition to siting the facility. The tax and transfer method enjoys the further advantage of being operational.

One consideration in designing the compensation mechanism centers on the conditions under which the externality is produced. If one thinks of risks as a joint product which arises as waste isolation services are produced, one may ask if risks are produced in fixed or variable proportions. For example, if risks

can be reduced through the addition of capital or other factor inputs, the need to compensate will be reduced. It is possible to add scrubbers to a coal fired electric station to reduce pollution output while leaving electrical generation the same. The more risks can be reduced in this manner, the less will be the reliance on fiscal transfers, although the costs of achieving risk reduction will still be borne by the facility. On the other hand, if risks and waste isolation services are produced in fixed proportions, the opportunity to reduce risks by increasing the costs of production is not available, and the burden of compensating for risks must be borne solely by the revenue transfer program.

A second consideration in this process is the nature of the utility function of the local citizen in the communities bearing the external costs. Thus far, it has been implicitly assumed that this citizen is able to place a dollar value on the costs incurred from the waste isolation activity and is willing to accept a payment through the local public sector in exchange for bearing this cost. We shall continue this assumption below. However, it should be borne in mind that it is this evaluation which largely determines the degree to which the production of risks can be modified as just discussed. For example, if neighboring communities feel that risks are lessened by improving the vehicles on which radioactive wastes are transported, this becomes a risk reducing option whereas if vehicle improvement reduces neither actual nor perceived risks, it is not. It may well be that these communities would prefer some combination of transfer payments and production outlays. It is possible that no action on the part of the facility could either compensate or reduce these costs.

Finally, there remains the problem of measuring the preferences of impacted communities regarding these external costs. This will prove difficult. First,

there is no market information available on which to base cost estimates directly. In the absence of this direct information, it will be necessary to either infer preferences indirectly or to create a pseudomarket (an auction perhaps) on which to base cost estimates.

Second, if individuals are questioned as to preferences or if auction methods are used, there exists a strong incentive to overstate harms suffered. To the extent that a large number of sites are considered, it may be possible to approach an efficient solution. In this case, communities which overstate the harms they suffer are not likely to be selected as sites. Of course, without an incentive bonus of some sort, they would have no reason to respond in any manner.

With these considerations in mind, the simple model developed above can now be applied to the externality question. In doing this, we may adopt one of two conventions in interpreting costs. We may view the costs as a modification to the community's preference function, whereas all previous levels of indifference are valued at a lower level following the imposition of the external cost, or we may view it as a reduction in real income whereby the budget constraint shifts to the left in a parallel fashion. Either method yields identical results, namely that identical proportions of private and public goods are consumed, and a lower level of utility is obtained. Thus, in principle, a system of "block grants" which bring about parallel outward shifts in the community's income constraint would be appropriate. Granted sufficient information on community preferences, one could choose the level of payments to either compensate communities equal to the loss incurred or provide incentives to accept the facility by permitting them to achieve higher levels of utility than before the siting.

## V. SUMMARY AND CONCLUSIONS

This paper has presented an analysis of transfer payments between a federally owned waste isolation facility and local governments affected by the facility. Two types of payments (in lieu of tax payments to host communities and block grants to other affected communities) are examined, and it is concluded that a variety of payment strategies are available. Some could provide incentives for communities to encourage siting.

The important aspect of this analysis has been to draw a distinction between the "compensation of costs" and the "provision of incentives." Unless a community can be shown to reach a higher level of indifference (utility) it will have no incentive to encourage the siting of a facility, whether or not the direct costs associated with the facility are compensated. Nevertheless, designing an intergovernmental revenue system that does provide incentives should not prove a difficult task.

This analysis also rests on a number of assumptions and utilizes a number of behavioral suppositions. First, it is assumed that a payments-in-lieu-of-taxes scheme based on tax equivalency is indeed a feasible alternative. If past DOE policies such as those used to encourage "self-sufficiency" in "Atomic Communities" underlie the development of the payment-in lieu-of-taxes schedule, it is unlikely that any incentives to site will be generated. Second, it is assumed that waste facilities inherently contain elements of risk that must be compensated. If levels of risk can be minimized through siting schemes or design, the role played by transfer payments is reduced, and the design of the payments system is simplified.

Third, it is assumed that communities are willing to trade off risk associated with waste facilities for transfer payments. Clearly, if this assumption is erroneous, or subject to special preconditions or qualifications, the probability of creating incentives is greatly reduced or perhaps no longer relevant.

Two sets of behavioral parameters are also highly important in successfully designing an incentive system based on transfer payments. The first regards the community response to the "price change" which occurs when a large increase in taxable capacity per worker is added to the tax roll. Estimating this parameter will require careful examination of the range of local governments in which the facility might be sited and will yield a range of payment estimates.

The second important parameter is that which governs the rate at which communities value the trade-off between risk and compensatory payments. Again, the estimation of this parameter will require careful examination of communities likely to be affected and will yield estimates of the magnitude of a transfer payment program to compensate or extend costs.

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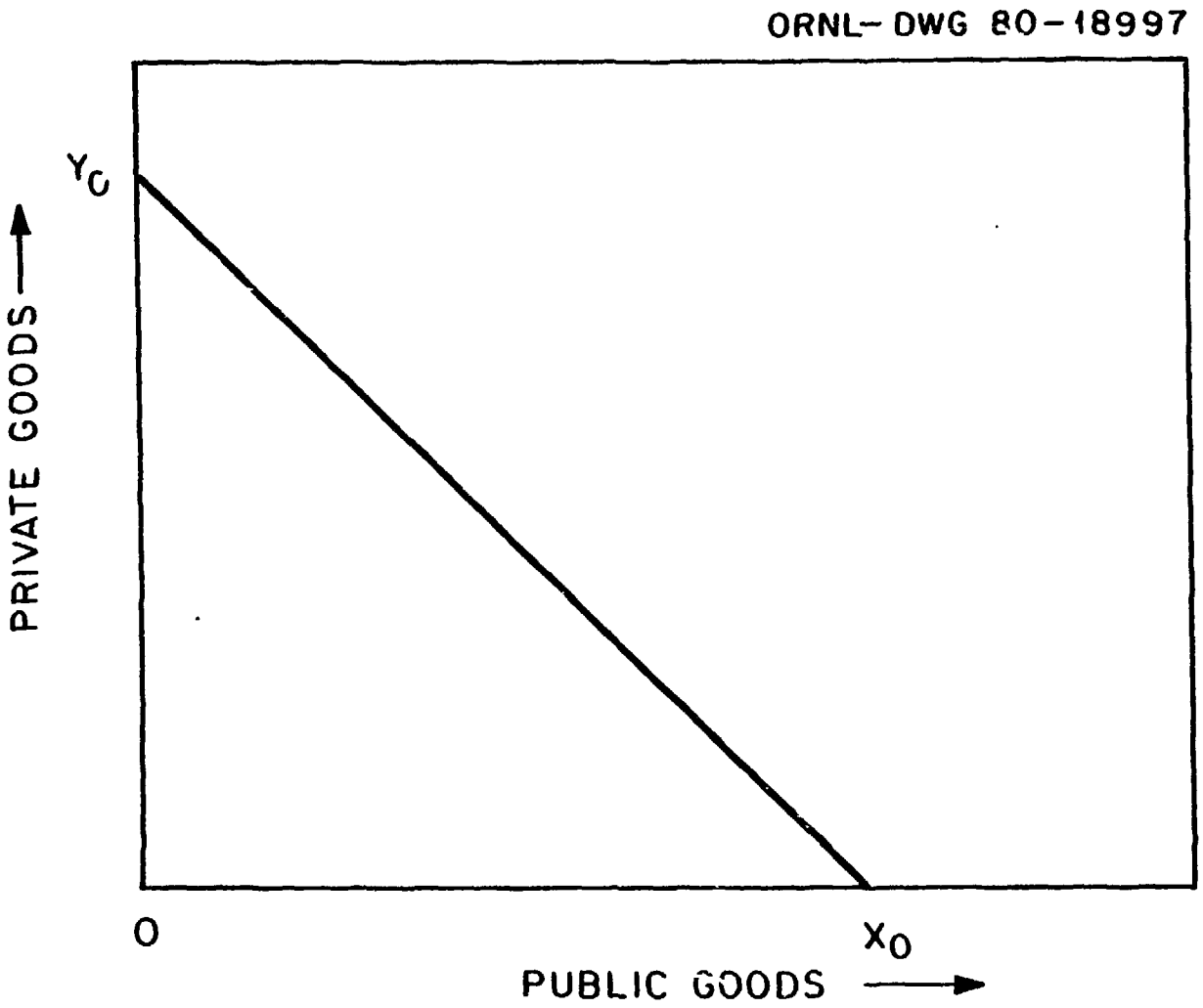


FIG. 1. COMMUNITY TRANSFORMATION CURVE BETWEEN THE PRIVATE AND PUBLIC GOODS

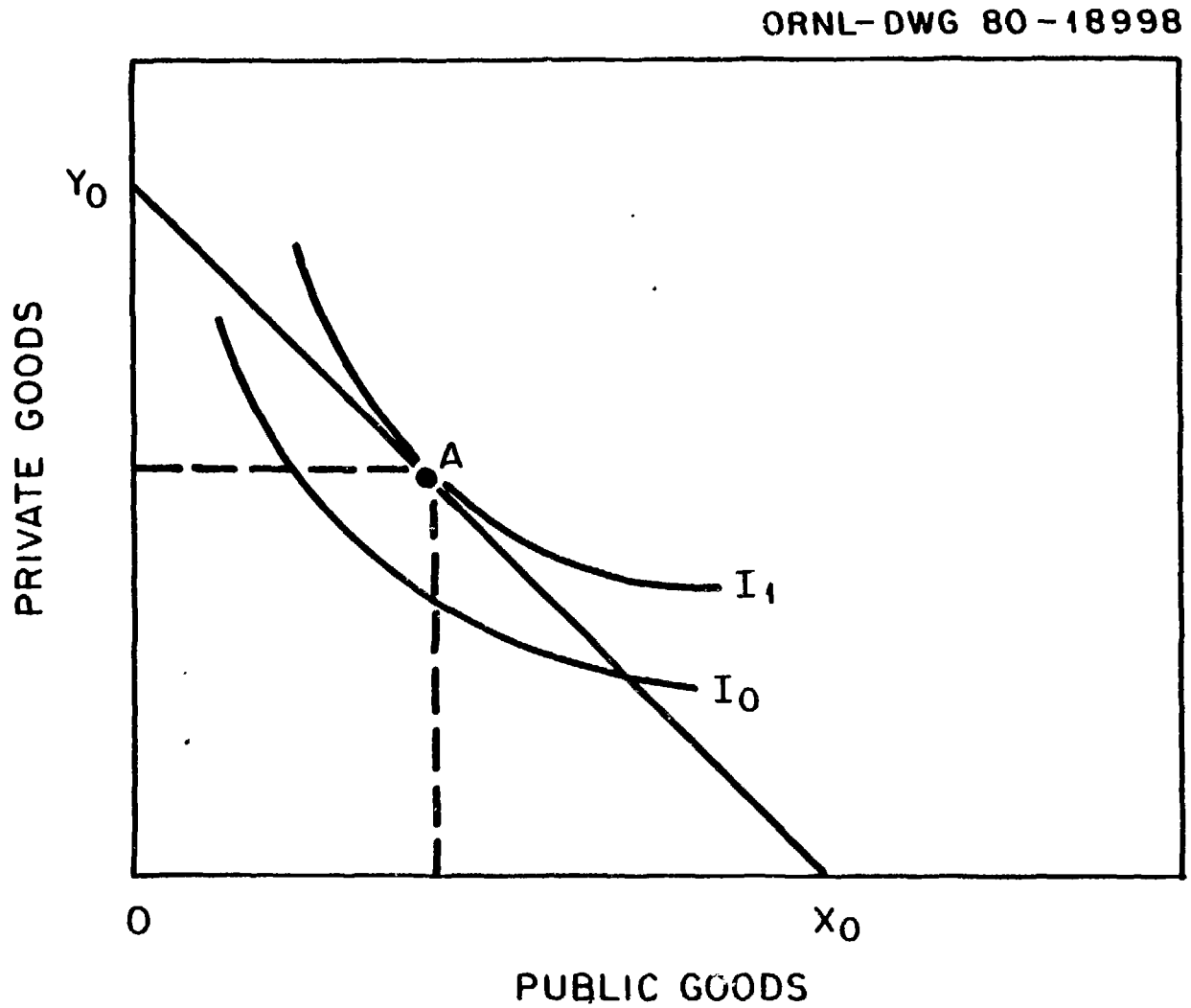


FIG. 2. EQUILIBRIUM LEVELS OF PUBLIC AND PRIVATE GOODS

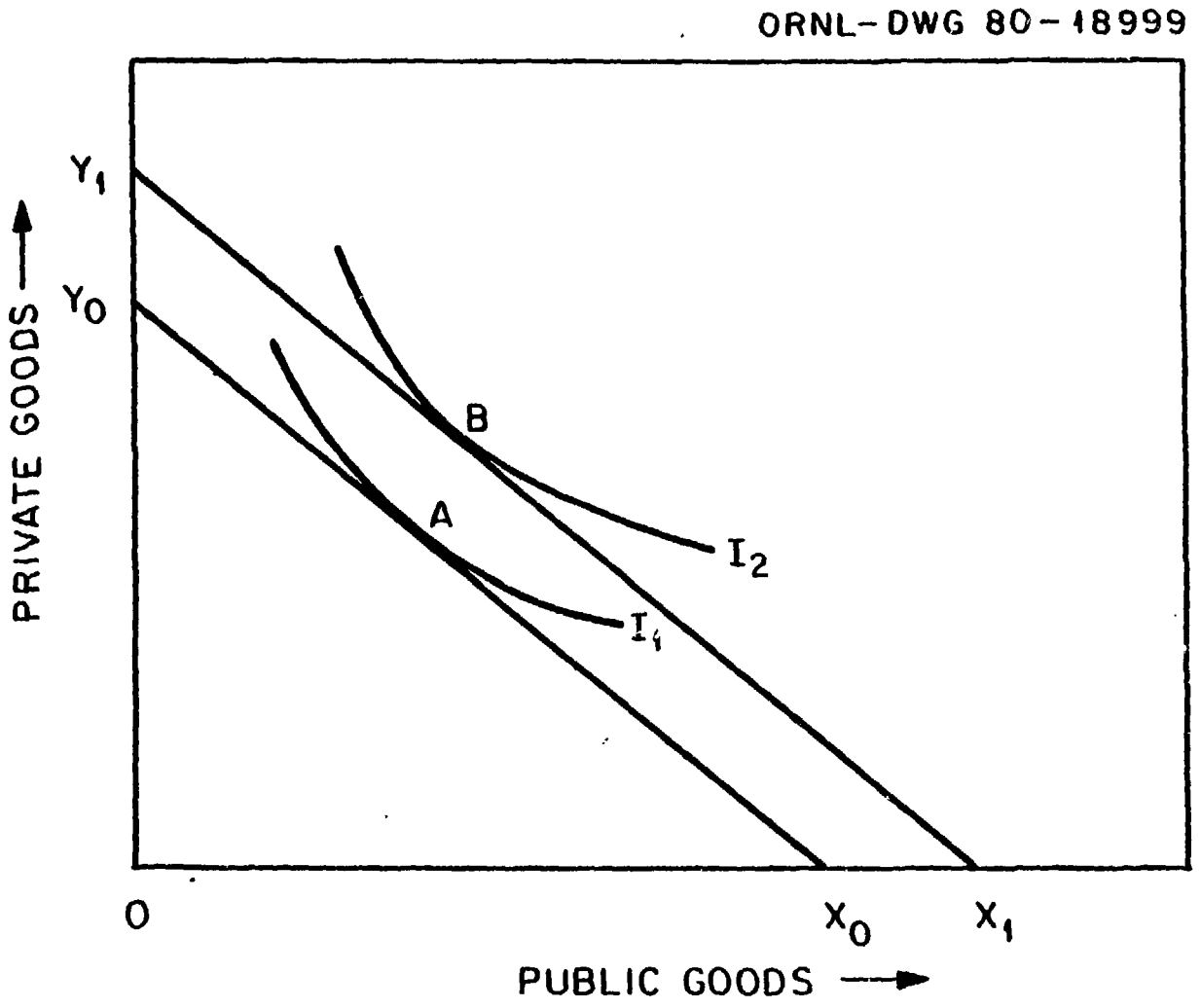


FIG. 3. AN INCREASE IN COMMUNITY INCOME

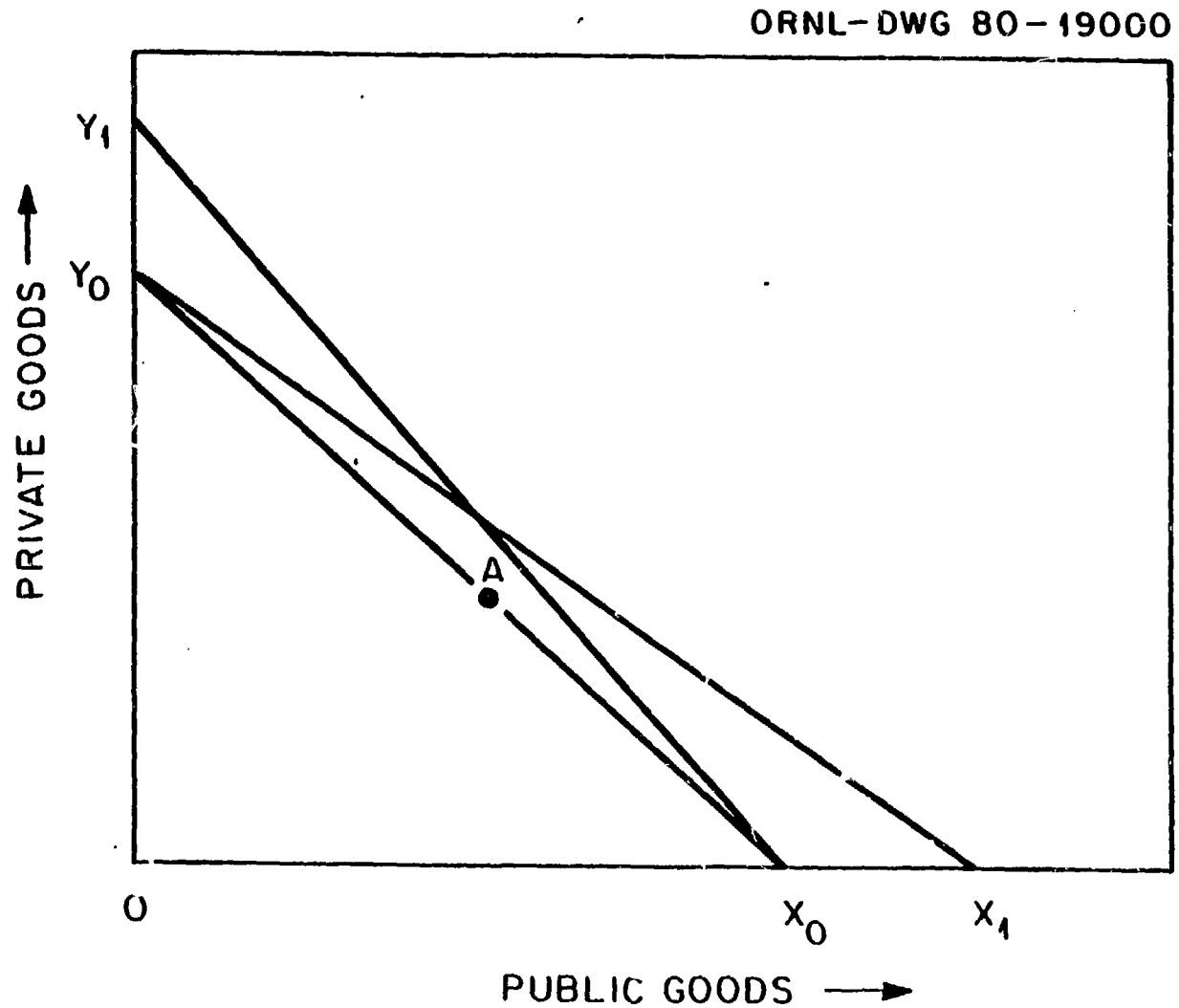


FIG. 4. TWO POLAR CASES OF WELFARE GAIN

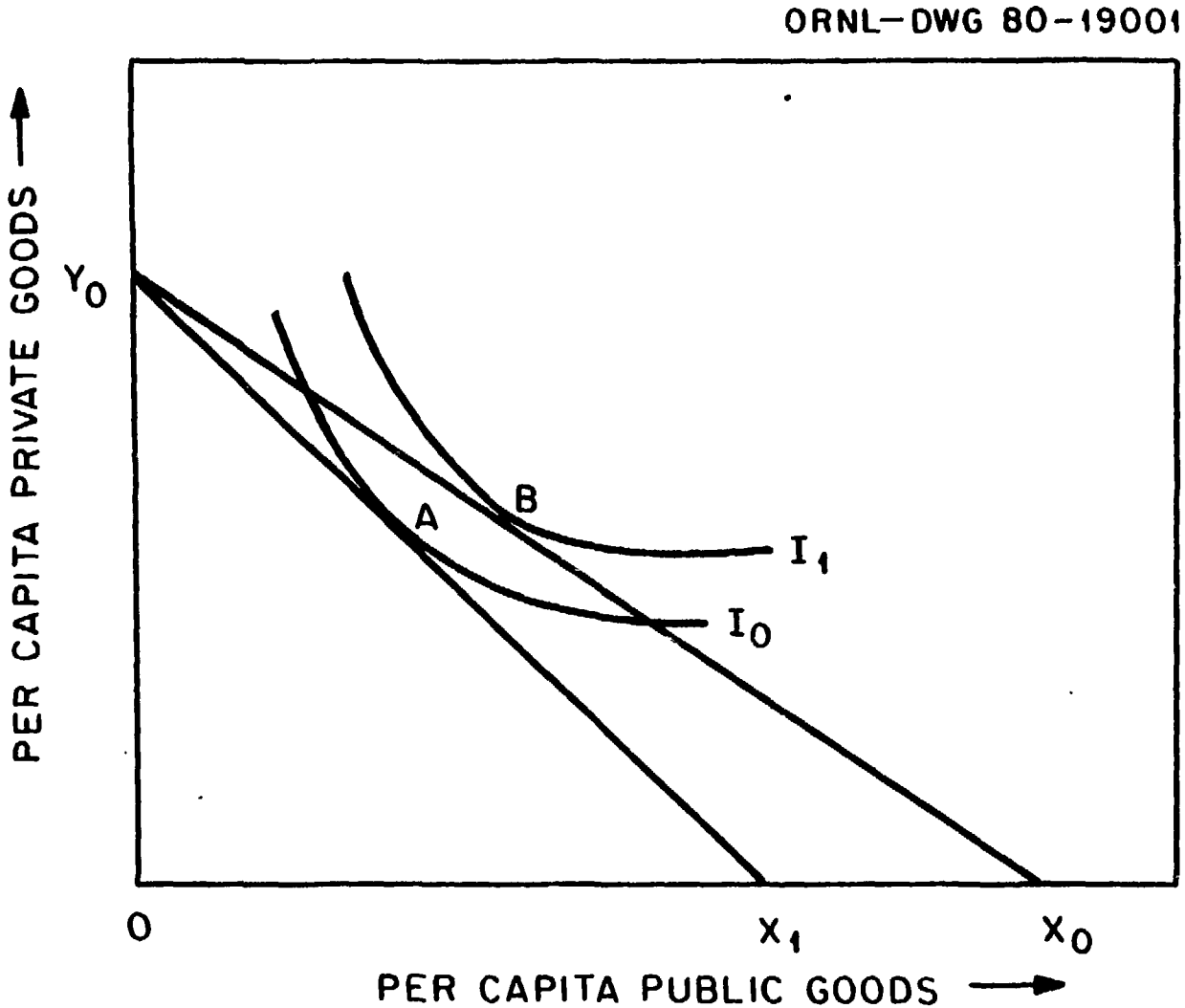


FIG. 5. AN INCREASE IN TAXABLE CAPACITY

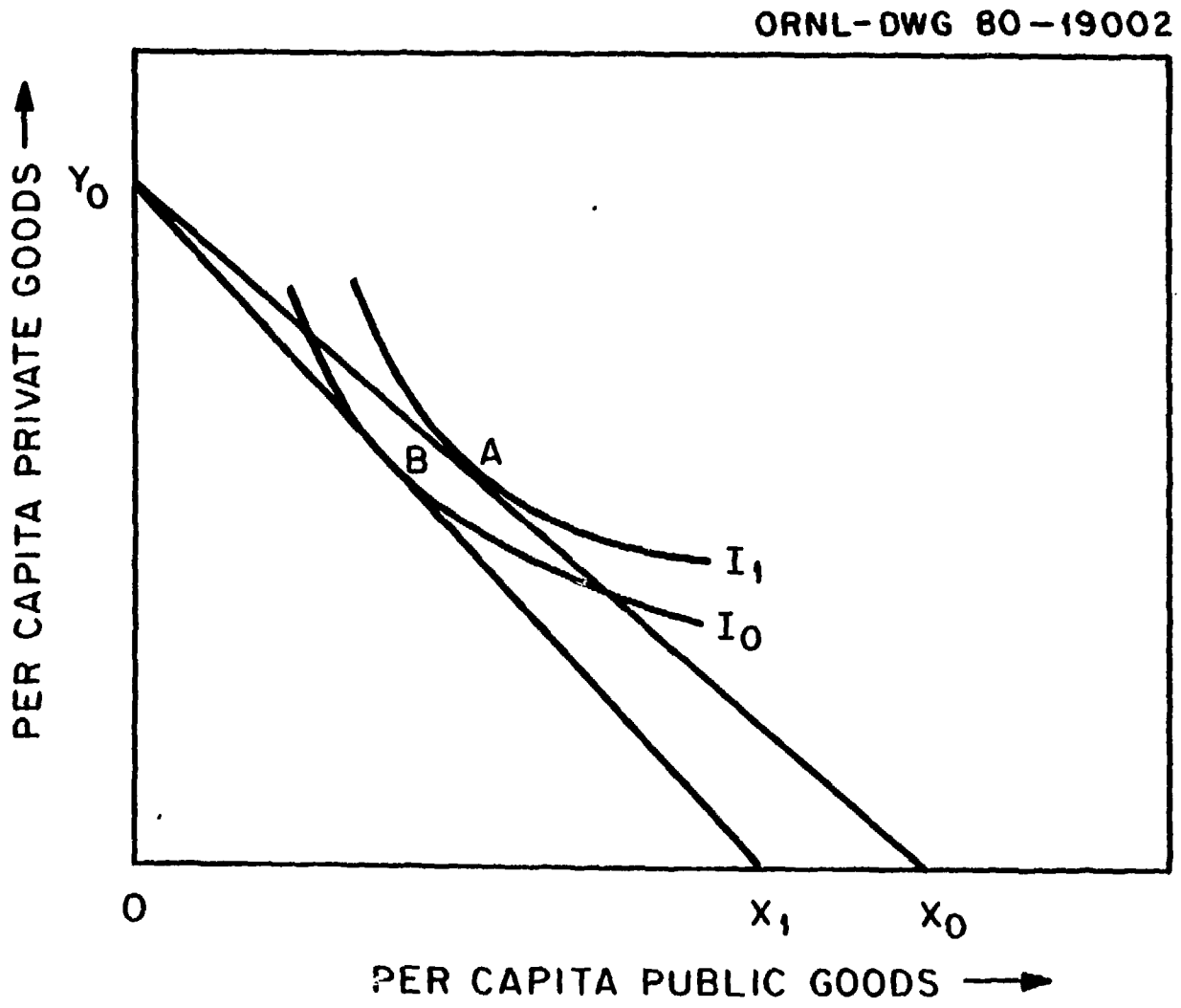


FIG. 6. A DECREASE IN TAXABLE CAPACITY

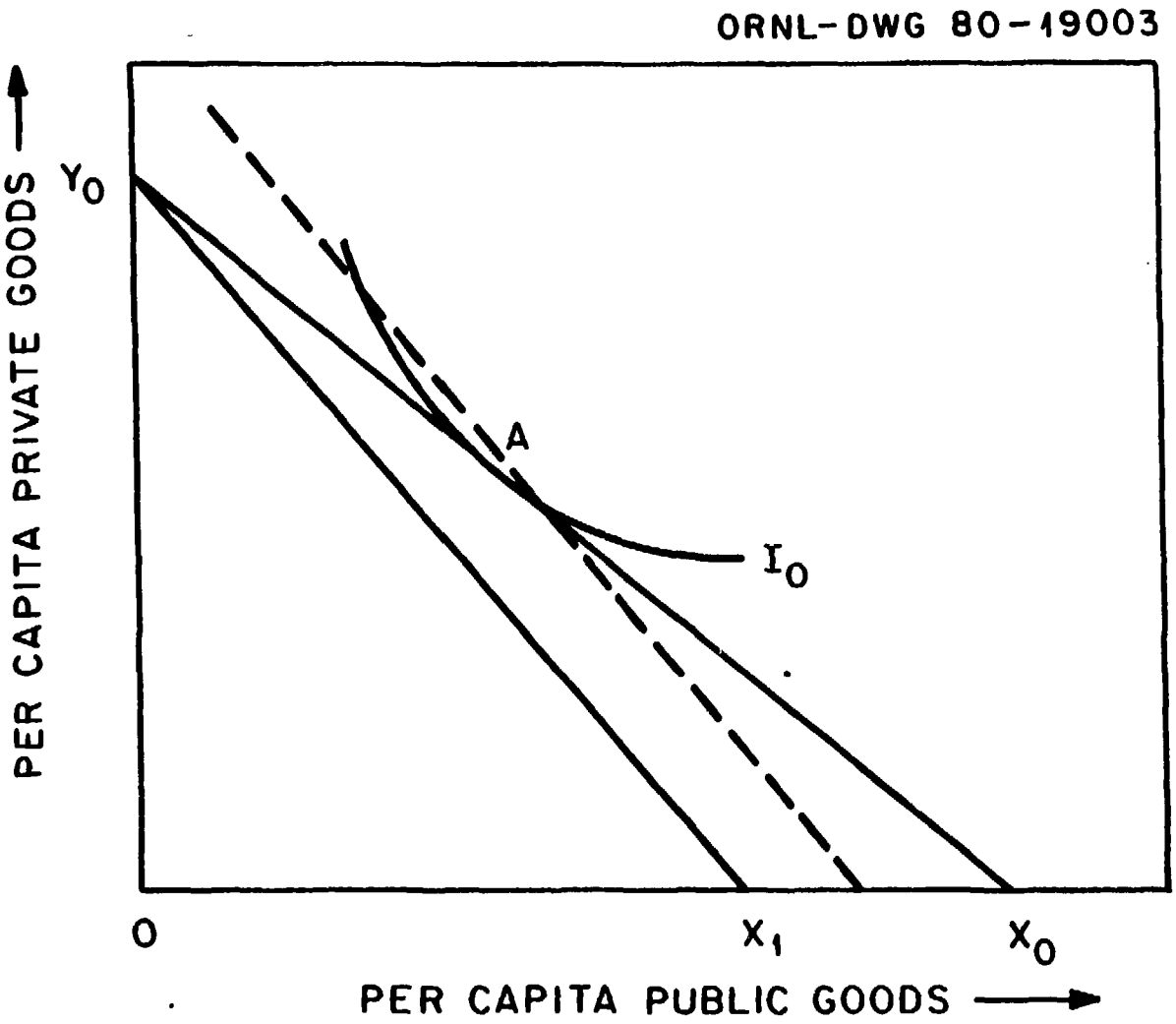


FIG. 7. A LUMP-SUM PAYMENT ALLOWING PURCHASE OF A

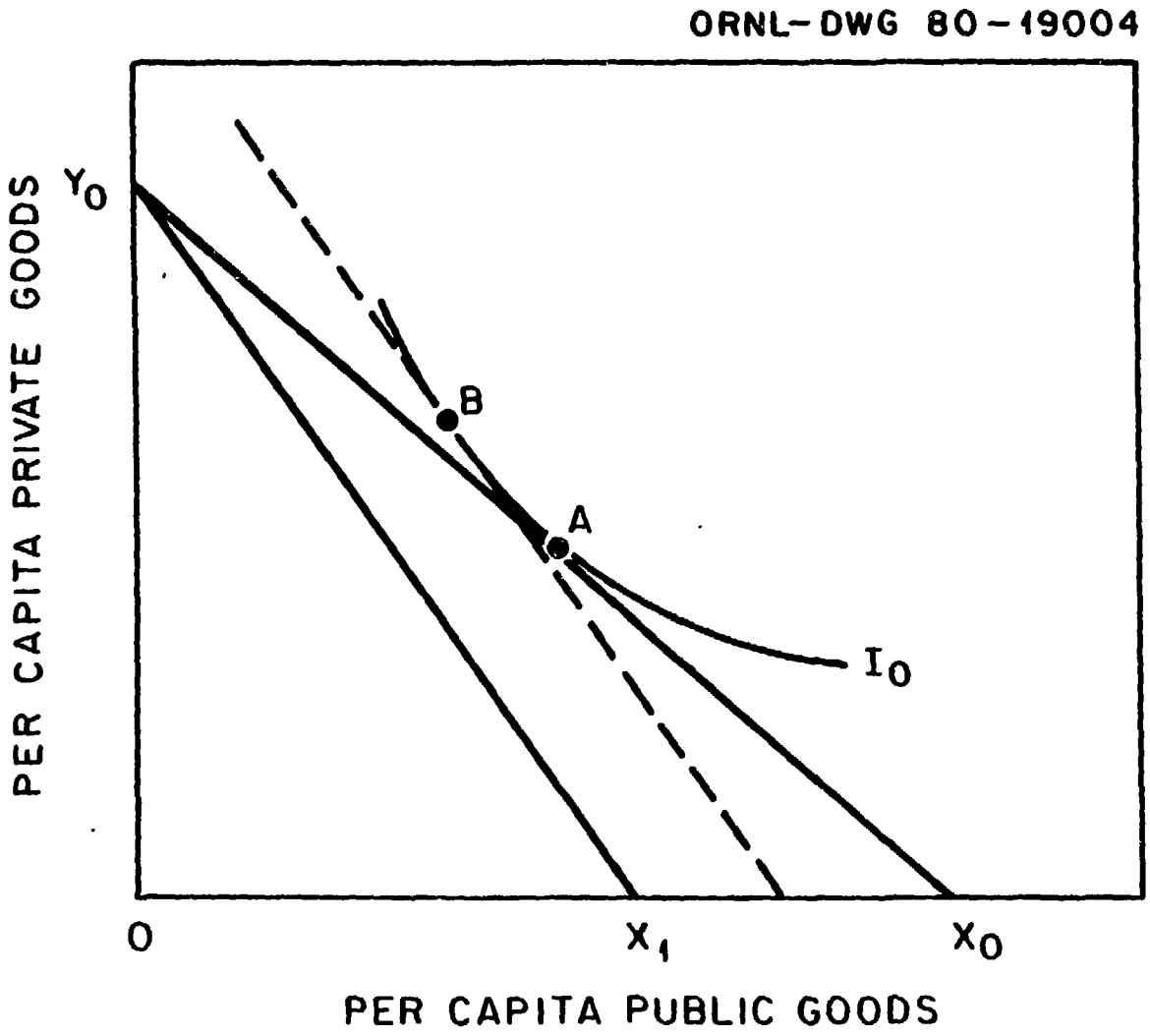


FIG. 8. A LUMP-SUM PAYMENT ALLOWING CONSTANT UTILITY