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A Proposal for Using Incentive Pre-Commitments in Public Enterprise Funding

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CENTER DISCUSSION PAPER NO. 558

A PROPOSAL FOR USING INCENTIVE PRE-COMMITMENTS
IN PUBLIC ENTERPRISE FUNDING

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ABSTRACT

Among the central problems of LDCs is the poor performance of their public enterprises (PEs), and the limited ability of governments and other agencies to improve this performance. In practice, a typical funding agency possesses extremely few levers to improve the performance of an ongoing PE, with perhaps the most potent lever being negotiation over the conditionality for original funding. The present paper suggests a more effective use of such limited levers.

We propose that project authorities should be asked and induced to undertake two kinds of pre-commitments at the time of funds approval; a pre-commitment to: (i) link a non-negligible part of the project's employees' compensation to the actual PE performance (we call this the "profit-sharing pre-commitment"), and (ii) liquidate the project if its ex-post performance falls below some threshold level (we call this the "liquidation pre-commitment"). Inducements might include making the availability and softness of funding contingent upon such pre-commitments.

We discuss three primary sources of PE losses (namely, conventional allocational inefficiencies, X-inefficiencies, and project irreversibility due to "soft budget constraints"), compare the likely relative magnitudes of associated losses, and argue how incentive pre-commitments would help ameliorate these losses. A simple illustration of the likely large order of magnitude of the "option" value of gains from reversibility is also presented.

This paper places a central emphasis on pre-commitments because, given the political-economic environment of an LDC, the feasibility of remedial actions is greatly reduced if provisions for such actions have not already been agreed upon in advance--and understood by the parties involved--at the project approval stage. Also, the basic idea of pre-commitments is not in conflict with other approaches for improving PE performance.

This paper does not take a position on whether PEs are or are not desirable. Under the premise that PEs are likely to remain important in LDCs in the foreseeable future, our objective is to develop some constructive steps towards improving PE performance. The proposed pre-commitments represent such a step because even though these pre-commitments will not solve all or most of the problems of PEs, and even though the magnitude of the resulting overall benefit would vary across situations, it is difficult to imagine scenarios where such pre-commitments could actually harm PE performance. By contrast, many scenarios can be envisioned where incentive pre-commitments and accountability will improve PE performance.

A PROPOSAL FOR USING INCENTIVE PRE-COMMITMENTS
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Raaj Kumar Sah and Martin L. Weitzman

Improving the performance of public organizations is a widely felt need at the present time. It has been articulated in different political contexts--in the socialist economies such as China and the USSR, in the mixed economies of LDCs, and in the market-oriented economies of North America and Western Europe. It has also been recognized that economic incentives and accountability must play a fundamental role in improving the performance of public organizations.

The objective of this paper is to propose and argue that the performance of public projects and enterprises in LDCs might be improved if some modest yet important changes are made in the procedures through which public projects are initially approved and funded, especially by external funding organizations. In particular, we explore the ramifications of having project authorities undertake pre-commitments, at the time of project approval, to link some part of employee compensation to enterprise performance, and to liquidate the enterprise if its performance falls below some pre-specified threshold level. The idea of these pre-commitments is not in conflict with other approaches for improving the performance of public enterprises. We argue that such pre-commitments are likely to have beneficial effects on the overall returns from public investments.

We begin, in Section I, with a very brief introduction to some of the problems associated with public enterprises (PEs) in LDCs. The objective is

only to set the stage for later analysis. A comprehensive review is not necessary here because the central features of the "public enterprise syndrome" are sufficiently well known to almost everyone with field experience.¹

In Section II, we discuss the economic nature of three primary sources of losses in public enterprises: conventional allocational inefficiencies, X-inefficiencies, and the irreversibility of projects due to "soft budget constraints." We argue that the losses due to irreversibility are likely to be larger than those due to X-inefficiencies and the latter, in turn, are likely to be larger than those due to allocational inefficiencies.

In Section III, we explain why, and argue, that incentive pre-commitments might be a possible way of alleviating some of the problems of PEs. This section also illustrates that large gains can be achieved if projects have built-in reversibility (that is, if they can be scaled down or liquidated when it is socially desirable to do so).

The next two sections deal briefly with issues concerning the implementation of pre-commitments. In Section IV, we discuss the mechanics of operationalization. Section V contains a discussion of some objections which might be raised against pre-commitments of the kind discussed in the paper.

I. BACKGROUND

There has been an unambiguous increase in the importance of public enterprises in LDCs since the mid-1960s. While PEs account for about 10 percent of the GDP of developed and developing countries taken together, this percentage is as high as 30 to 40 for several LDCs. PEs have been

established by LDC governments for a variety of economic, sociopolitical and hybrid motives. Among the presumed reasons have been the desire to force-draft savings, the desire to bridge the entrepreneurial gap by undertaking projects which might otherwise not be undertaken, the desire to control the "commanding heights" of the economy, and the desire to dilute the concentration of economic power held by a few large business groups. Donor agencies' policies have also been a significant influence, particularly during the 1970s when several donor organizations appeared to have exhibited a preference toward PE investment.

It has been increasingly recognized that the rise and the current importance of PEs in LDCs is best viewed as a consequence of political-economic forces in these countries and throughout the world at large. For instance, the "nobler" goals of PEs (such as employment creation, establishment of new industries and reduction in the concentration of economic power) have in the past received, and continue to receive, vocal support from several segments of the LDC population. At the same time, the poor performance of PEs and their cost to the economy--to the extent these costs are visible--have increasingly become a source of popular frustration. How the scope and the importance of PEs changes in LDCs in the future would depend in part on how the political forces supporting different perceptions of PEs balance one another and, in particular, on what role is played by those organized groups whose interests are directly affected by PEs. The premise on which our present proposals are based is that the proportion of the LDC resources committed to PEs will remain sizable for the foreseeable future, even though this proportion may undergo some decline from the current level.

Performance: PEs have in general performed disappointingly relative to

their economic potential or relative to the economic motivations which might have spawned them. Their performance has perhaps not been any better with respect to other social goals, even though such an assessment cannot be made with precision, given the relative lack of framework, data and analysis.

The simplest indicators of PE performance are their profit and loss accounts. Using these, several studies have shown that the aggregate profitability of PEs has lagged behind that of the private sector.² More disaggregated studies support similar conclusions. The persistence of poor financial returns has scuttled one main aim of creating PEs, that their surpluses would contribute to development efforts in other parts of the economy. In addition, PE external borrowings have been significant and have contributed to the current debt problems of LDCs.³

Concerning the performance of PEs on criteria other than financial ones, the prevailing opinion (which we share) is that performance on socio-economic criteria has been below expectations. It has been widely noted, for instance, that PEs have created very little direct employment because of their typically high capital intensity, and that induced employment creation has perhaps also been insubstantial. Further, a common argument supporting PEs has been that, since there are very few instruments for income redistribution in LDCs, the pricing of the outputs of some of the PEs can serve to redistribute income. There are natural economic limitations, however, to such an approach.⁴ Also, given the waste and inefficiencies associated with typical PEs, it is unlikely that any significant redistribution to the poor has actually taken place through this mechanism.

A highly visible aspect of PEs in most LDCs is that a number of enterprises have continued to operate even though they are imposing, and would

continue to impose, large costs on the economy. At one extreme, there are PEs where abandoning the enterprise would be better for the economy even if all present employees continued receiving their compensation for their remaining work life; that is, the value of the output of such PEs does not even cover the non-wage costs of operations.

Given the importance of PEs in LDCs and the level of dissatisfaction with their performance, it is not surprising that an extensive debate has taken place on how to deal with these problems. One obvious reaction has been that the existing PEs should be divested through various means such as privatization and plant closing and no fresh investment should be put into existing or new PEs. This reaction has obvious justifications in many circumstances. Yet, given the political economy of most LDCs, it is unlikely that such an approach would find wide acceptance.⁵

Other approaches have aimed at policy reforms at different levels. At the economy-wide level, for instance, it has been argued that external trade and domestic credit policies should be altered so that PEs not only receive economically relevant signals but also the costs of PEs become explicit rather than being partly hidden, as is often the case at present. At the industry level, it has been argued that PEs should face more extensive private competition, domestic as well as external. Some studies have indicated the need for enterprise-specific reforms; in particular, reforms concerning the degree and nature of autonomy of PEs from government control, and reforms concerning the staffing and structure of PE management.

The proposals which we discuss later have a somewhat different emphasis in that they are aimed at influencing the economic premises and the disciplinary environment under which PE investment is undertaken. Our proposals

are thus not in conflict with, nor a substitute for, the ongoing need for reforms of the type described above. In fact the pressure for undertaking certain types of reforms (particularly, enterprise-specific reforms) might well be strengthened by the presence of incentive pre-commitments.

II. NATURE OF LOSSES UNDER PUBLIC ENTERPRISES

To understand the sources of poor performance of PEs, we find it useful to subdivide the efficiency or welfare losses into three broad categories:

(i) Traditional allocational inefficiencies from the wrong factor and product mix.⁶

(ii) X-inefficiencies that arise, essentially, from lack of motivation or effort to use economic opportunities as effectively as they might be used.⁷

(iii) Inability to shut down or scale back operations when losses are incurred, due to the "soft budget constraint" laxity that the government typically permits public enterprises.⁸

Traditional allocational inefficiencies arising from the wrong factor and product mix, of type (i) above, form a central theme of traditional price theory. Trade distortions, effects of imperfect competition and markets, tax and subsidy distortions, and effects of incorrect price setting are all familiar subjects falling in this category. In many cases, the forces generating these inefficiencies are economy-wide or industry-wide government policies, rather than enterprise specific policies. Most attempts by economists to understand efficiency losses in LDCs and elsewhere have focused on these areas.

We in no way desire to minimize losses of this traditional sort. In

many specific instances inefficiency losses of type (i) have been shown to be substantial. But our belief is that losses of type (i) are usually less important in practice than losses of type (ii) or (iii). This is because inefficiency losses of type (i) are quadratic or second-order in a well defined sense,⁹ which in many practical cases means losses of not overwhelming magnitude.¹⁰

X-inefficiency losses are also fairly well known. Although it is difficult to make precise estimates of the magnitude of these type (ii) losses, arguably they are substantially larger than type (i) losses are likely to be. Leibenstein (1981) cites studies whose figures suggest that the magnitude of X-inefficiency losses at any one time in the United States may be between 20 to 40 percent of net national product. These numbers seem high, but even if they are somewhat off the mark, inefficiency of type (ii) is likely to be a more serious matter than inefficiency of type (i) because of the difference between first- and second-order losses. The differences in organizational motivation or effort (primarily due to differences in incentive mechanisms) are held by some to be a major cause of the large differences in productivity which have been observed across countries with alternative economic systems.¹¹

The third type of inefficiency, due to de facto public project irreversibility, is probably least well understood in development economics because much of the technical literature is recent (typically involving stochastic diffusion processes), and it has been applied mostly to situations with well-developed capital markets. Yet these type (iii) inefficiency losses, we believe, are likely to be the largest in magnitude of the three classes enumerated above. As we show later, it is not uncommon to

find that with even moderate levels of uncertainty, the opportunity value of project reversibility can be surprisingly large, and an investment rule that ignores it will be grossly in error.

A primary source of inefficiency of type (iii) is that workers, managers and bureaucrats view themselves as having acquired various kinds of de facto property rights to continued employment (typically within the same enterprise) once they have been employed in a particular PE. These workers and managers, then, impose significant political costs on the government if it were to attempt to deny or curtail their employment property rights. The resulting political costs are sufficiently large for the government that it tends to bail out failing PEs even though the resulting costs may sometimes be enormous.

III. VALUE OF INCENTIVE PRE-COMMITMENTS

If one asks the general question why losses of the kinds described above occur in PEs, the almost universal answer is that there are either no incentives or wrong incentives to avoid such losses. The lack of a payment or reward system linked to profitability breeds apathy and vested interest in the status quo. Without motivation to seek and maintain high levels of profitability, traditional allocational inefficiencies of type (i) and insufficient effort leading to type (ii) inefficiency are bound to arise. Once pay and job security are insured more or less independently of economic performance, it is politically very difficult to shut down or scale back a failing enterprise, giving rise to type (iii) inefficiency.

The need to introduce appropriate incentives is, therefore, self-evident. We believe that this task can be more easily achieved if a funding

agency is in a position to negotiate and impose pre-commitments for incentive mechanisms, at the very beginning of project funding, as a not unreasonable pre-condition for receiving the loan and support. In particular, it would be useful to introduce two types of pre-commitments: (a) a profit-sharing pre-commitment stipulating that a non-negligible part of the compensation of managers and workers would be systematically linked to enterprise performance, and (b) a liquidation pre-commitment stipulating that the public enterprise will be liquidated (through the sale of assets and control) if its cumulative performance at pre-specified dates in the future is not above certain threshold levels.

There has been little or no systematic analysis or evaluation in the past of the idea that a poorly performing PE should be automatically liquidated according to a pre-specified schedule. In contrast, the general idea that the compensation of employees should be made sensitive to an enterprise's performance is obviously not new.¹² A novel aspect of our proposal, however, is the idea that performance-related incentive schemes should be employed as pre-conceived components of project formulation and implementation.

In the next two subsections, we discuss how pre-commitments for incentive mechanisms would help ameliorate the basic efficiency problems of public enterprises. The bottom line summary is that it is possible to think of many reasons why these pre-commitments can improve PE performance, while, by contrast, it is difficult to envision scenarios under which such pre-commitments can have significant deleterious effects on PE performance.

A. Benefits from Profit-Sharing Pre-Commitments

The theoretical literature concerning the effects of profit sharing on work effort is fairly sparse.¹³ On the one hand, there is the commonly made observation that when workers' pay contains a component tied to output or profitability, it is bound to increase work effort because increased effort is automatically rewarded by increased pay. Offsetting this claim is the notion that gain sharing is unlikely to significantly increase effort in multi-worker situations because the effect of any one worker's increased effort is diluted. Also, there is the idea that if profit sharing was such a good method of motivating workers we would see more of it. These criticisms, in turn, have been countered by pointing to important externality effects. As an example, it can be shown that the positive effects of gain sharing on effort in a multi-worker setting are reinforced in a repeated situation where workers can influence, directly or indirectly, each other's level of effort. On the whole, this literature raises some of the relevant issues but, as is typical in theoretical economic debates, it does not provide definitive answers.

On the empirical side, there is some indication that profit sharing is associated with increased productivity and profitability. Although it is difficult to summarize succinctly the results of well over a dozen studies based on different samples and methodologies, the following generalization seems fair. It is typical to find a significant raw correlation between profit sharing and various signs of a firm's good health, like profitability and productivity. When other variables like capital stock, size, etc. are controlled for in the regressions, the degree of association weakens. With these other factors being included as independent variables in the regres-

sions, profit sharing continues to be significantly associated with increased productivity and profitability in some studies, while the association is statistically insignificant in others. However, no studies we have read find a statistically significant negative association between profit sharing and productivity or profitability.

Moving to the next issue, profit sharing might help to reduce inefficiencies due to project irreversibility. This is because the major constituency opposed to scaling back unprofitable public enterprises is the workforce, which loses jobs that typically have much higher private economic value (including better pay) than the next best alternative. The job loss issue transcends the immediate work force, because there are regional employment multipliers. If pay has responded automatically to profitability, it has already been lowered (or raised) in some proportion to how badly (or well) the enterprise has been performing. In poorly performing enterprises, thus, there will be less political will to oppose scaling back, or the scaling back may even occur automatically in extreme cases due to natural labor attrition.

A cynic might ask the following question: if government authorities lacked the political will to make pay cuts and scale back operations in the first place when the enterprise is doing poorly, and this was a prime cause of the problem, why should profit sharing make any difference? The answer is that there can be a world of difference between a pre-condition that all parties agreed on beforehand, and an action that can be interpreted as an arbitrary change in the rules of the game. Suppose that the pre-commitment to profit sharing is part of the loan package, that many or most loan packages of this sort contain such a provision, and that all employees must sign

on to this provision when they sign on to a job in the initially-better-paying public enterprise. The lower pay that comes with poor performance is then part of the game--government authorities can then legitimately claim that they never could have gotten the loan package in the first place unless they had agreed to play by these rules. The acceptance of such rules is strengthened the more other players play by them.

B. Value of Liquidation Flexibility

The primary role of a liquidation pre-commitment, in our view, is that it introduces reversibility into public projects; that is, it makes it possible to a greater degree for the society to save on future costs by terminating a poorly performing PE. Since the value of such flexibility is likely to be quite large, and since this topic is somewhat unfamiliar in the context of LDC public enterprises, we present an explicit calculation of the order of magnitude of the economic gain from reversibility. Our analysis is based on a highly stylized model which permits a closed-form solution of the "reversibility premium." The qualitative results will not be significantly altered if the model is extended to more complicated cases (for which one would need to calculate numerical solutions). The underlying methodology of working with stochastic diffusion equations is rather typical,¹⁴ although the application to calculating the appropriate cost-benefit criteria in a project setting has not yet to our knowledge been accomplished elsewhere.

Specifically, we work out a comparison between two investment alternatives--one of which is irreversible and the other partly reversible. These alternatives are based on two projects.¹⁵ One of the projects is irreversible. This means that once this project is started, it cannot be stopped

and must be run through to completion. Suppose that the relevant annual discount rate for cost benefit comparisons is r . Let the expected net present discounted value of the irreversible project be denoted V , assumed to be positive. Thus, from an expected value point of view, the irreversible project can be treated as equivalent to a hypothetical infinitely lived project having the constant net annual flow value $F = Vr$.

The other project is reversible. This means that this project can be stopped at any time it is deemed economically desirable. To pose the issue sharply, we suppose that only one of the two projects at a time can be undertaken (such a condition might come about naturally because of underlying constraints). Then the two investment alternatives are: (1) to go with the irreversible project forever, or (2) to start with the reversible project and go with it unless and until some sufficiently bad outcomes are revealed to cause a switch to the irreversible alternative.

Our aim is to calculate the "option value" of the inherent flexibility which the second alternative delivers compared with the first. That is, we seek to know what difference reversibility has on traditional cost-benefit criteria. Heuristically, we would like to know how much less than the irreversible project can the reversible project be allowed to pay, and still make it more attractive to start off, and continue with, the reversible project. This difference is a measure of the option value of the reversibility per se.

Now, suppose that the reversible project has the following form once it is initiated. The net income flow follows a random walk with zero drift and annual standard deviation σ . This means that if the income flow at the current time is X , the distribution of income flow t years hence is normally

distributed with mean X and standard deviation $\sigma\sqrt{t}$. If the reversible project is chosen initially, then one has the option of bailing out of the project if X declines by "too much" over time. If the irreversible project is initially selected, then the clock never starts running on the reversible project and the irreversible project goes on.

Under the second investment alternative (that is, when the reversible project is initially selected), it can be shown that the optimal stopping policy which maximizes expected present discounted value has the following intuitive form. The reversible project has a reservation price P associated with it such that this project should be chosen over the irreversible project if and only if $X > P$. In other words, if at time zero $X(0) \leq P$, then the irreversible project is chosen. If at time zero $X(0) > P$ then the reversible project is chosen initially and continued at any time t so long as $X(t) > P$. At the first instant τ when $X(\tau) = P$, the reversible project is terminated and the irreversible project is initiated.

The next logical question is: what is P ? It turns out that

$$(1) \quad P = F - \sigma/\sqrt{2r} .$$

That is, the reservation price P of the reversible project is the difference between the "certainty equivalent" F and the "flexibility option value" $\sigma/\sqrt{2r}$. The option value of a given reversible project measures its incremental worth over the hypothetical irreversible alternative of receiving the certainty equivalent income forever. The option value is directly proportional to the annual standard deviation σ , which parameterizes the degree of uncertainty in the difference between the flexible and inflexible options. When a reversible project is available, it is chosen with a premium

that increases in proportion with σ because the larger is σ the larger is the chance of randomly drifting toward a desirably high value of X within a relatively short period of time. Hence, the higher is σ the more should the project maker be inclined to invest in the reversible project even though it is currently paying a lower income than the comparable irreversible project, because information will be revealed relatively quickly, and if the reversible project does not drift up in value toward the irreversible project, it could always be terminated in favor of the irreversible project.¹⁶ Equation (1) also shows that the desirability of the reversible project is inversely proportional to the discount rate r . The reason is simple. With a low enough discount rate, the project selector cannot afford not to initially invest in the reversible project (primarily to see whether it drifts up in value to be comparable with or better than the irreversible project) because there is always the option of shifting to the irreversible project if the reversible project turns out badly.

The following calculation gives some idea of the orders of magnitude involved. Suppose the annual standard deviation, σ , of the reversible project is made higher by a dollar. Then how much lower can the lowest value of the annual flow from the reversible project be, and yet leave it profitable not to replace the reversible project with the irreversible project. From equation (1), the answer is seen to be $1/\sqrt{2r}$. When $r = 5\%$ per annum, this value is \$3.16. When $r = 10\%$ per annum, this tradeoff value is \$2.24. With numbers like these, it should be easy to appreciate why the standard cost-benefit criteria may be seriously distorted when they do not take into proper account the value of reversibility in a project, which is likely to be considerably higher than is commonly appreciated.

Before concluding, it might be useful to comment briefly on the incentive effects of liquidation pre-commitments. Though there do not exist theoretical or empirical studies which permit a quantitative assessment of the incentive effects in different circumstances, it appears to us a reasonable presumption that those effects of liquidation pre-commitments which might raise the productivity of workers and managers (such as the fear of project shut down motivating employees towards greater productivity) are likely to outweigh those other effects which might lower productivity (for instance, a reduction in job-specific learning due to the fear of job loss).

Liquidation pre-commitments can also have some desirable indirect effects on project design and implementation. For instance, often there are political pressures on project authorities to choose an uneconomic location or an uneconomic technology. Such political pressures are unlikely to disappear, but we suspect that they will be weakened in the presence of liquidation pre-commitments. A different kind of indirect effect of liquidation pre-commitment is that it might encourage a more open and extensive discussion, ex-ante, of the downside of a proposed public investment. In this process, the project agency as well as the lending agency might become more aware of those aspects of project design, financing and institutional capabilities which are central to the future performance of the project.

C. Implications for Social Cost-Benefit Analysis

The idea underlying social cost-benefit analysis is simple. A project is viewed as a perturbation in the economy, and the overall cost-benefit is calculated by imputing the economic or social value to each of the consequences of the project (for instance, on outputs, inputs and foreign exchange).¹⁷ In practice, the typical approach to dealing with project

uncertainty has been to do sensitivity analysis with respect to variables such as the shadow wage rate, shadow exchange rate and international prices.

From the point of view of this paper, social cost-benefit analysis can be turned into a more active and potent tool for improving the overall return from public investments. It can be used to calculate the value of liquidation pre-commitment by comparing scenarios under which the project turns out to perform poorly but cannot be liquidated to those scenarios under which there is a substantial probability of the same project being liquidated. Our earlier analysis indicates that the net gains from reversibility can be large. What social cost-benefit analysis can do is to impart precision to the magnitude of these gains for specific projects. Likewise, the scope of cost-benefit analysis can be enlarged to assess how the rate of return on a project might be affected by different profit-sharing commitments.

Actually, the mere requirement that a project evaluation report should include an explicit discussion of the reasons why the project might underperform, what are the likely associated costs, and what is to be done about it, will bring some general pressure to deal with these issues more honestly. More specific calculations from cost-benefit analysis can be used not only to assess the economic value of pre-commitments, but also to determine the magnitude of preferential treatment to be given to projects which agree to build in incentive pre-commitments. In this sense, the modifications in cost-benefit analysis suggested here are not only of potentially first-order magnitude, but also their results have a direct implication on the conditionality of project funding.

IV. OPERATIONALIZATION

A. Inducements

Perhaps there is no better way to encourage incentive pre-commitments than to make them attractive to project authorities. A lending agency can achieve this by adopting a policy of the kind that projects with such pre-commitments will have to face less stringent hurdles such as a smaller economic rate of return required for funding. A similar effect can be achieved by making the softness of the loan (that is, the subsidy element in the rate of interest and the ease of repayment schedule) dependent on whether and to what extent a project agreement incorporates incentive pre-commitments.

Though the above proposals are more applicable to new projects and investments, a similar approach may be feasible to some extent for those ongoing projects which have future economic potential and which are in need of substantial borrowing and expansion. On the other hand, no matter how desirable in principle it might be to introduce incentive mechanisms in other ongoing projects, we believe it will be much more difficult to persuade the project authorities to do this because of the existing implicit promise not to threaten job security or pay. This is the basic reason why the present paper has placed so much emphasis on incorporating pre-commitments as political "rules of the game" that are agreed upon right from the beginning of a project.

International organizations can also use their leverage, to some extent, in policy dialogues to encourage a more general use of incentive pre-commitments (for instance, the use of pre-commitments in projects funded by domestic public sources). This might in fact be more attractive than some other public enterprise reforms which have been discussed in the past. For

instance, reforms concerning the degree and nature of autonomy of public enterprises are not only difficult to specify with any precision, but they are also difficult to negotiate and monitor for an outside agency. The changes in the project approval procedure suggested here, by contrast, are easier to implement, even though such changes are not a substitute for other reforms.

B. Performance Criteria

Since incentive pre-commitments entail that specific actions be undertaken contingent upon enterprise performance, it is necessary to address the question how PE performance should be measured. This question has been debated extensively in centrally planned economies and, to some extent, in LDCs, even though the typical context of past discussions has been the ex-post evaluation of enterprise performance for such purposes as auditing.¹⁸

The basic source of controversy in devising a method for evaluation of a PE's performance is as follows. There is not that much disagreement on the set of potential performance indicators (such as private and public profitability, cost-effectiveness, service quality, R+D, secondary employment generation) which might reflect various aspects of overall performance. What is inherently controversial is how to measure indicators which are qualitative (such as service quality), whether to use only a few or many indicators, and how to weigh different indicators to arrive at a single, scalar, measure of overall performance.

Such controversies should not be surprising because there are several inescapable trade-offs involved. As one example, simplicity and clarity are more easily achieved if a few, relatively unambiguous indicators (particularly those reflecting financial profitability) are uniformly employed

across most enterprises. Among the virtues of such an approach are that it provides clearer signals (that is, everyone has a clearer understanding of the government's expectations concerning pre-commitments), it reduces the possibilities of ex-post disputes concerning the interpretation of the evaluation method, it imparts a greater consistency in the evaluation of different types of enterprises (and thereby reduces the possibilities of favoritism and capriciousness), and it is less demanding on administrative resources. On the other hand, such an approach may not capture the legitimate special circumstances which apply to different PEs, and can thus run into conflict with the perception of fairness across enterprises operating under different market conditions and under different policy environments.¹⁹ As a result, it is not possible to devise in practice a "perfect" method for evaluating a PE's performance, even though such a method may be desirable and theoretically feasible.²⁰ But at the same time, we believe that it is not necessary to find a perfect method. In fact, an overextended debate about the method of evaluating PE performance can easily become counterproductive. There are at least two reasons for this.

First, in many circumstances, there is a strong correlation among major indicators of an enterprise's performance. That is, if one major indicator (say, financial profitability) is showing a low performance for a particular enterprise, then it is more likely to be the case than not that some other major indicator (say, service quality) also exhibits low performance. One consequence of such overlaps among major indicators is that the marginal usefulness of adding one more indicator to the set of indicators on which the evaluation is based declines, whereas the corresponding costs increase, as the number of indicators in the set increases.

Second, it is operationally better to base incentive mechanisms on some reasonable measures of performance (theoretically crude though they might be for the reasons stated above) than not to have incentive mechanisms at all. That is, the "imperfections" of measurement criteria should not be used as an excuse not to encourage incentive mechanisms and accountability as a part of the project approval process. This is because the social gains from having incentive mechanisms (which we discussed earlier) would in general compensate for the crudeness of performance measures.

C. Institutional Mechanism

Implementation of incentive pre-commitments would require the institutional mechanism and capability to undertake routine ex-post evaluation of projects. To a very limited degree, the experience of ex-post evaluation exists in some LDCs and multilateral organizations. Sample evaluations have been undertaken, for instance, for the purpose of auditing and for learning from past experience.²¹ More recently, there have also been some limited attempts to evaluate the sustainability of a sample of projects (that is, whether a particular project is capable of generating a satisfactory flow of net economic benefits).²² To implement pre-commitments, however, there would be a need for a more comprehensive and a more clearly defined institutional process of ex-post evaluation. While such extensive ex-post evaluation is desirable by itself, it should be recognized that a certain extra potential for controversy is inherent in the task of implementing pre-commitments. This is because the judgment on whether or not a particular pre-commitment is being satisfied will have direct operational consequences. Yet, the overall controversy associated with the consequent remedial actions could be significantly less than that in the case where corresponding remedial

actions are attempted without pre-commitments of the kind discussed in this paper.

Finally, a central objective of incentive schemes is to alter the assumptions under which workers and managers of PEs operate and to change--to the extent possible--the economic environment of public enterprises. This objective might be more easily achieved if extensive publicity is given on an ongoing basis to the relative performance of public enterprises and to the government's responses to different levels of performance. Such publicity can serve as an important source of motivation to the top management of PEs. More importantly, PEs operate under a complex political environment where public support is important for the success of most policies which concern worker compensation and employment. Such support is more likely to be forthcoming if the public is aware of what the policy is and how it is being implemented.

V. POSSIBLE OBJECTIONS

A. Credibility of Implementation

There are many examples of LDC governments announcing policy changes and then, under political pressure, altering the changes or reverting back to earlier policy. Given such a track record, it is reasonable to argue that: (i) even if pre-commitments are undertaken for a set of projects, a government may invent ways to circumvent their implementation, and (ii) even if a government intends to implement a pre-commitment, this possibility might not be taken seriously by employees and other interested parties and, correspondingly, the incentive effects of the pre-commitment may be diluted.

These problems are simply a reflection of the political economy of the

public sector. It is possible however that the presence of third parties (in particular, multilateral organizations) can ameliorate such problems. There are at least two reasons for this. First, the presence of third parties might make it more desirable for the government to implement a pre-commitment, at least to the extent that the ongoing relationship with third parties is considered valuable by the government. Second, in those cases where a government does wish to impose discipline on PEs, it might be helped by the presence of third parties. For instance, in its attempt to liquidate a poorly performing PE, a government might find it desirable to emphasize that its "hands are tied" by the existing pre-commitments.

B. Manipulation by Managers

A reasonable question is whether the introduction of incentive pre-commitments would induce managers and employees of PEs to manipulate the environment (for example, to seek greater protection from international competition) so that the resulting economic outcome is worse than that without pre-commitment. Conceptually this is possible, but it is unlikely for several reasons. First, most of the manipulations which can potentially take place, given the political setup, are perhaps already taking place. Second, the presence of well-publicized pre-commitments might have an effect of bringing a greater degree of public scrutiny to the demands exerted by employees of the public sector which, in turn, may reduce the degree to which these demands are satisfied. Finally, even in the extreme case where the government does not intend to take advantage of the disciplinary opportunities offered by pre-commitments, perhaps the worst that can happen is that government policies would be altered to negate the potential positive consequences of incentive mechanisms.

FOOTNOTES

1. Among reviews emphasizing different aspects are Baumol (1980), Floyd, et al. (1984), Gillis, et al. (1983, Ch. 21), Jones (1982) and Nellis (1986). Also, it is not necessary for our purpose to be rigid about the definition of a PE, because the main issues we emphasize apply to a broad range of publicly invested and publicly controlled organizations (except perhaps short-term public projects devoted exclusively to creating infrastructure). For definitions of PEs, see Bohm (1981) and Jones (1982).
2. For instance, a recent summary based on a cross-country sample showed that PEs have a lower profitability than the corresponding private enterprises in each of the eight industrial subsectors under consideration. See Ayub and Hegstad (1987, pp. 84 and 86).
3. A method to evaluate some of the macroeconomic consequences of PE performance is discussed in Floyd, et al. (1984).
4. See Sah (1983) for an analysis of the limitations on redistribution through pricing or through taxation and subsidization of goods. See Sah (1986) for a more general analysis.
5. For preliminary data showing that this is the case in many sub-Saharan countries, see Nellis (1986). For a discussion of some of the experiences of divestiture, see Berg (1985).
6. See standard texts such as Varian (1984) and Atkinson and Stiglitz (1980).
7. See Leibenstein (1976) for references.
8. Kornai (1980) has written extensively about the effects of soft budget constraints on state enterprises in Eastern European style economies.

9. See Weitzman (1987) for a rigorous presentation of this argument.
10. As James Tobin has quipped in a somewhat different context: "It takes a heap of Harberger triangles to fill an Okun gap." Among the earliest studies of allocational efficiency losses are those of Harberger (1964, 1966). Since then this matter has been empirically studied in a variety of settings.
11. A recent calculation of such differences in productivity is by Bergson (1987) who shows that the output per worker in a sample of socialist economies is lower by more than 25 percent compared to that in a sample of western market economies, even after the outputs have been adjusted for differences in capital and land per worker.
12. It has been tried in some cases on a consistent basis, most recently in South Korea, with success. See Park (1986).
13. See for example the summary in Estrin, Jones and Svejnar (1987).
14. See Brennan and Schwartz (1985), Majd and Pindyck (1987) and McDonald and Siegel (1986).
15. The analysis could be extended to several different projects.
16. This result may appear somewhat counterintuitive in the sense that a reversible project has greater relative premium if the uncertainty, σ , is larger. The reason, as indicated above, is that a larger σ increases the "optimal value" or "flexibility value" of starting with a reversible project. This and other qualitative results hold, in suitably modified form, even if the investment choice is based on expected utility maximization under risk aversion rather than on expected value maximization.

17. For recent reviews of cost-benefit analysis and project evaluation, see Srinivasan (1982) and Dreze and Stern (1987).
18. In the literature of centrally planned economies, this is typically referred to as the problem of "success indicators." See, for example, Berliner (1976) for discussion and further references. For a recent summary of the conventional economic difficulties in measuring public sector output, see Stiglitz (1986, Ch. 7).
19. Such an approach also does not deal adequately with the issue of basing the performance measure on factors under a PE's control while stripping out the effects of factors outside the PE's control. The stripping of some of the latter factors is possible and desirable (such as input and output taxes and subsidies implicit in pricing policies) while it is intrinsically difficult to do so for other factors (such as consequences of government policies on technology imports).
20. In principle, it is possible to measure the public profitability of a PE based on shadow prices derived from social cost-benefit analysis. However, the complexity of such a measure increases markedly especially if the full general equilibrium effects are traced out. Also, since shadow prices depend on the underlying model of the economy, the needs of contractual arrangements (e.g., clarity and standardization) would require not only an articulation of the model, but also the retention of the same model for several years.
21. See World Bank (1986).
22. See World Bank (1985).

REFERENCES

- Atkinson, Anthony and Joseph E. Stiglitz, 1980, *Lectures on Public Economics*, New York: McGraw-Hill.
- Ayub, Mahmood A. and Sven O. Hegstad, 1987, "Management of Public Industrial Enterprises," *The World Bank Research Observer*, January, pp. 79-101.
- Baumol, William J., ed., 1980, *Public and Private Enterprises in a Mixed Economy*, New York: St. Martin's Press.
- Berg, Elliot, 1985, "Divestiture of State-Owned Enterprises in LDCs," mimeo, Washington, D.C.: The World Bank.
- Bergson, Abram, 1987, "Comparative Productivity: The USSR, Eastern Europe, and the West," *American Economic Review*, June, pp. 342-357.
- Berliner, Joseph, 1976, *The Soviet Innovation Decision*, Cambridge: The MIT Press.
- Bohm, Andreja, 1981, "The Concept, Definition and Classification of Public Enterprises," *Public Enterprises*, vol. 1, pp. 72-78.
- Brennan, Michael J. and Eduardo S. Schwartz, 1985, "Evaluating Natural Resource Investments," *Journal of Business*, January, pp. 135-157.
- Dreze, Jean and Nicholas Stern, 1987, "The Theory of Cost-Benefit Analysis," in Auerbach, Alan J. and Martin Feldstein, eds., *Handbook of Public Economics*, Chapter 14, Amsterdam: North-Holland.
- Estrin, Saul, Derek C. Jones and Jan Svejnar, 1987, "The Productivity Effect of Worker Participation: Producer Cooperatives in Western Europe," *Journal of Comparative Economics*, March, pp. 40-61.
- Floyd, Robert H., Cline S. Gray and R. P. Short, 1984, *Public Enterprise in Mixed Economies: Some Macroeconomic Aspects*, Washington, D.C.: International Monetary Fund.

- Gillis, Malcolm, Dwight H. Perkins, Michael Roemer and Donald R. Snodgrass, 1983, *Economics of Development*, New York: Norton.
- Harberger, Arnold C., 1964, "Taxation, Resource Allocation and Welfare," in Conference Report of NBER and Brookings Institution, *The Role of Direct and Indirect Taxes in the Federal Reserve System*, pp. 25-70, Princeton, NJ: Princeton University Press.
- _____, 1966, "Efficiency Effects of Taxes on Income from Capital," in Krzyzaniak, M., ed., *Effects of Corporate Income Tax*, pp. 107-117, Detroit: Wayne State University Press.
- Jones, Leroy P., 1975, *Public Enterprise and Economic Development*, Seoul: Korea Development Institute.
- _____, ed., 1982, *Public Enterprise in Less Developed Countries*, New York: Cambridge University Press.
- Kornai, Janos, 1980, *Economics of Shortage*, Volume B, Amsterdam: North-Holland.
- Leibenstein, Harvey, 1976, *Beyond Economic Man*, Cambridge, MA: Harvard University Press.
- _____, 1981, "Microeconomics and X-Efficiency: If There is No Crisis, There Ought to Be," in Bell, Daniel and Irving Kristol, eds., *Crisis in Economic Theory*, New York: Basic Books.
- Majd, S. and Robert Pindyck, 1987, "Time to Build, Option Value and Investment Decision," *Journal of Financial Economics*, March, pp. 7-27.
- McDonald, Robert L. and Daniel R. Siegel, 1985, "Investment and the Valuation of Firms When There is an Option to Shut Down," *International Economic Review*, June, pp. 331-350.

- Nellis, John R., 1986, "Public Enterprises in Sub-Saharan Africa," World Bank Discussion Papers No. 1, Washington, D.C.: The World Bank.
- Park, Young C., 1986, "A System for Evaluating the Performance of Government-Invested Enterprises in the Republic of Korea," World Bank Discussion Papers No. 3, Washington, D.C.: The World Bank.
- Sah, Raaj Kumar, 1983, "How Much Redistribution is Possible through Commodity Taxes?" *Journal of Public Economics*, February, pp. 89-101.
- _____, 1986, "Positive Limitations on the Scope of Redistribution in Market-Oriented Economies," Working Paper, New Haven, CT: Yale University.
- Srinivasan, T. N., 1982, "General Equilibrium Theory, Project Evaluation and Economic Development," in Gersovitz, Mark, et al., eds., *The Theory and Experience of Economic Development*, London: George Allen and Unwin, pp. 229-250.
- Stiglitz, Joseph E., 1986, *Economics of the Public Sector*, New York: Norton.
- Varian, Hal, 1984, *Microeconomic Analysis*, New York: Norton.
- Weitzman, Martin L., 1985, *The Share Economy*, Cambridge, MA: Harvard University Press.
- _____, 1987, "Consumer Surplus Triangles and Rectangles as Exact Approximations," forthcoming, *Quarterly Journal of Economics*.
- The World Bank, 1985, "Sustainability of Projects: First Review of Experiences," Washington, D.C., June.
- _____, 1986, "The Directory of Reports Issued by the Operations Evaluation Department," Washington, D.C., October.