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# AN EFFICIENCY APPROACH TO THE EVALUATION OF POLICY CHANGES

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**ABSTRACT**

This paper describes an efficiency approach to the evaluation of policy changes. Rather than comparing the utility allocations that arise before and after a policy change is introduced, this approach evaluates a policy change by comparing it with other possible changes which might be made from the status quo. The main merit of the approach is that it is founded on the Pareto criterion rather than on a distributional value judgement. The paper provides a precise statement of the approach and applies it to a number of examples. Some objections to the approach are also anticipated and discussed.

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# 1. Introduction

One goal of welfare economics is to provide a method for evaluating policy changes. A basic question in welfare economics is therefore what should determine whether or not a policy change is deemed desirable? While research on this question has not been active of late, the issue remains far from resolved. This paper takes a fresh look at the problem, exploring an alternative way the theory of policy evaluation might proceed.

There are two main approaches to policy evaluation in the literature, one using social welfare functions and the other compensation criteria. The *social welfare function approach* evaluates a policy change by comparing the utility allocations that arise before and after the change. A social welfare function is postulated which ranks alternative utility allocations and the policy change is deemed desirable if the new utility allocation generates a higher level of social welfare than the status quo.

The *compensation criteria approach* avoids direct comparision of the status quo and post-policy change utility allocations. The most popular criterion, due to Kaldor (1939), evaluates a policy change by comparing the status quo utility allocation with the set of utility allocations that can be reached through lump sum redistribution from the post-change situation. A policy change is deemed desirable if there exists a utility allocation in the latter set which Pareto dominates the status quo. This implies that it is possible to redistribute (with costless lump sum transfers) from the beneficiaries of the change to the losers in such a way as to leave all parties better off.

Both these approaches suffer from well-known difficulties.[1] Since Robbins (1938), many economists have found the social welfare function approach unacceptable because it involves making interpersonal comparisons of utility for which there is, as yet, no scientific basis. The approach also leaves open the question of what the right social welfare function is. While compensation criteria have the advantage that they do not require interpersonal comparisons of utility, their ethical justification is unclear. In the case of the Kaldor criterion, why should the fact that the gainers *could* compensate the losers make socially desirable the infliction of those losses? Moreover, compensation criteria can produce inconsistent policy recommendations in the sense that they can simultaneously recommend introducing and removing the same policy change.

[1] For a good general review see Boadway and Bruce (1984).

Such difficulties have led many to conclude that the welfare economic analysis of policy changes is a dead end.[2] However, as stressed by Little (1958), an alternative way of evaluating a policy change is to compare it with other possible policy changes and such comparisons can be made in an uncontroversial way. Specifically, the analyst can always ask whether a policy change is efficient in the sense that there exists no other feasible policy change which produces a Pareto superior utility allocation. If a policy change is efficient in this sense, the policy change is a sensible way of implementing the distributional changes it induces. The case for the policy change is then a question of whether these particular distributional changes are desirable - a question which requires a distributional judgement to resolve. However, if it is not efficient, then it seems reasonable to declare the policy change socially undesirable, for if the distributional changes it induces are desirable, it is better (using only the ethical judgement underlying the Pareto criterion) to achieve these changes through some other means.

The above logic suggests an *efficiency approach* to the theory of policy evaluation. When confronted with a particular policy change, the policy analyst would not investigate whether the social value of the utility gains exceed the social value of the losses or whether the gainers might in principle compensate the losers. Rather, he/she would investigate alternative policy changes that could be made with similar distributional consequences. A policy change would be judged efficient if there did not exist an alternative policy change which was better for all. Inefficient policy changes would not be recommended, on the grounds that there exist alternative policy changes which generate Pareto superior outcomes. Efficient policy changes would be deemed sensible ways of achieving the distributional changes that they produce. The policy analyst would take no position on the desirability of these changes.

This paper argues that such an efficiency approach represents a coherent approach to the theory of policy evaluation which fits naturally with current thinking in normative public economics. The paper begins with a formal statement of the efficiency approach, a comparison with the social welfare function and compensation criteria approaches, and a discussion of how it relates to modern normative public economics and ideas from cost benefit analysis. The paper then illustrates

[2]The following quote by Baumol (1946-7) is typical: "As soon as a redistribution of income is involved in some innovation, the economist is prevented from passing judgement on the desirability of that innovation since he is unable to tell whether the change in distribution is good, bad or indifferent, or whether the importance of this latter effect is of sufficient magnitude to vitiate any other considerations which may have led to recommendation or rejection of the proposal." (p. 46)

the approach by applying it to three separate examples relating to regulation, the provision of public goods and public production. The examples serve to show how the efficiency logic works and the types of implications it has. The paper also anticipates and discusses some objections to the efficiency approach.

## 2. The Efficiency Approach

### 2.1. *A Statement*

The typical situation envisaged by welfare economics is one in which a "policy-maker" proposes a policy change and a "policy analyst" is given the job of evaluating it. The theory of policy evaluation tries to provide a consistent procedure by which the analyst may determine whether or not the policy change is "socially desirable". To provide a formal framework in which to discuss the problem, consider an economy consisting of $n$ citizens, indexed by $i \in \mathcal{N} = \{1, ..., n\}$. Let $p$ denote a vector of government policies and let $V_i(p)$ denote citizen $i$'s (indirect) utility when the policy vector is $p$. Let $p_o$ denote the status quo policy vector and let $\Delta p'$ denote the proposed policy change.

The efficiency approach evaluates $\Delta p'$ by comparing it with other feasible policy changes. Letting $\Delta\mathcal{P}$ denote the set of all feasible policy changes, the policy change $\Delta p'$ is *efficient* if there does not exist $\Delta p \in \Delta\mathcal{P}$ such that $V_i(p_o + \Delta p) \geq V_i(p_o + \Delta p')$ for every citizen $i \in \mathcal{N}$ with the inequality holding strictly for at least one citizen $i$. If $\Delta p'$ is efficient, the approach declares it a sensible way to achieve the distributional changes it produces. The case for it then depends on a distributional judgement. If $\Delta p'$ is not efficient, the approach declares it undesirable on the grounds that there exists an alternative feasible policy change which is better for everyone.

### 2.2. *Comparison with the Social Welfare Function Approach*

As noted in the introduction, the social welfare function approach evaluates the policy change $\Delta p'$ by comparing the post-change utility allocation $\{V_i(p_o + \Delta p')\}_{i\in\mathcal{N}}$ with the status quo utility allocation $\{V_i(p_o)\}_{i\in\mathcal{N}}$. A social welfare function $\mathcal{W}(V_1, ..., V_n)$ is postulated and the change is recommended if and only if it enhances the value of the social welfare function; i.e., $\mathcal{W}(\{V_i(p_o + \Delta p')\}_{i\in\mathcal{N}}) > \mathcal{W}(\{V_i(p_o)\}_{i\in\mathcal{N}})$.[3]

[3]In some of the modern literature on cost benefit analysis, the social welfare function is assumed to be chosen by the policy-maker (see, for example, Dreze and Stern (1987)). Then,

Two points concerning the differences between the two approaches are worth noting here.[4] First, the efficiency approach adopts a different notion of social desirability than the social welfare function approach. Under the latter, a policy change being undesirable means that undertaking it will not enhance some notion of societal well-being. Under the former, a policy change being undesirable simply means that there exists another policy change that would be better for all. Both notions of undesirability seem legitimate, but it is important in interpreting the efficiency approach to keep the distinction clear.

Second, it is not necessary to view the efficiency approach as an alternative to the social welfare function approach. By comparing the proposed change with other policy changes, it is simply focusing on a different question. The answer to this question is of interest even when one is using the social welfare function approach. When a policy change is inefficient then there will exist an alternative policy change which will lead to a bigger increase in societal well-being than the proposed change.

### 2.3. *Comparison with the Compensation Criteria Approach*

There are two compensation criteria relevant for our analysis; the *Kaldor criterion,* described in the introduction, and the *Hicks criterion* (Hicks (1940)). The latter evaluates a policy change by comparing the post-change utility allocation with the set of utility allocations that can be reached through lump sum redistribution from the status quo. A policy change is deemed desirable if there does not exist a utility allocation in the latter set which weakly Pareto dominates the post-change situation. This implies that it is not possible to redistribute (with costless lump sum transfers) from the potential losers to the beneficiaries in such a way as to leave all parties better off than they would be under the policy change. The Hicks criterion is similar in spirit to the Kaldor criterion, but goes in the reverse direction.

A common criticism of these criteria is that in reality government is unlikely to be able to employ lump sum transfers. Informational problems, constitutional restrictions on policy instruments and administrative costs, mean that real world redistributive policies may be significantly cruder and involve substantial dead-weight costs (Samuelson (1950), Graaff (1957)). Later interpretations of the com-

the job of the analyst is simply to inform the policy-maker as to whether the policy change will enhance his objectives and distributional judgements play no role. Under this view, the idea that there is some absolute notion of social desirability is explicitly rejected.

[4]Some further differences are discussed in section 4.

pensation criteria have therefore often insisted that the compensations be made using the available redistributive instruments (see, for example, Dixit and Norman (1986) and Dreze and Stern (1987)).

Under this interpretation, the Kaldor and Hicks criteria may readily be illustrated in our framework. Suppose that the government's policy instruments can be divided into two categories; tax-transfer instruments and levels of public goods, public inputs, etc. Formally, suppose that $p = (t, g)$ where $t$ is a vector of tax-transfer levels and $g$ is a vector of public production decisions. The policy change will typically involve changes in both tax-transfer levels and public production levels. Let $\Delta t'$ and $\Delta g'$ denote these changes, so that $\Delta p' = (\Delta t', \Delta g')$. The policy change $\Delta p'$ satisfies the Kaldor criterion if there exists $\Delta t$ such that $(\Delta t, \Delta g') \in \Delta \mathcal{P}$ and $V_i(p_o + (\Delta t, \Delta g')) \geq V_i(p_o)$ for every citizen $i \in \mathcal{N}$ with the inequality holding strictly for at least one citizen $i$. It satisfies the Hicks criterion if there does not exist $\Delta t$ such that $(\Delta t, 0) \in \Delta \mathcal{P}$ and $V_i(p_o + (\Delta t, 0)) \geq V_i(p_o + \Delta p')$ for every citizen $i \in \mathcal{N}$ with the inequality holding strictly for at least one citizen $i$.

Checking whether a policy change satisfies these criteria is formally similar to checking whether a policy change is efficient. The similarity of the Hicks criterion is most transparent since it compares the proposed policy change with other feasible policy changes. Indeed, any policy change which does not satisfy the Hicks criterion must also be inefficient. (The converse is not true because the Hicks criterion restricts comparisons to a subset of policy changes; namely, variations in the tax-transfer system.) The Kaldor criterion differs in focusing on a comparison of other similar changes (in the sense that $\Delta g = \Delta g'$) with the option of doing nothing, rather than with the proposed change. This means that satisfying the Kaldor criterion is neither necessary nor sufficient for a policy change to be efficient. However, if a policy change satisfies the Kaldor criterion, the policy change defined by reversing it once it is in place is inefficient. Thus, eliminating the change is an inefficient way to help those who the change hurts. (Of course, it is not clear why this should be relevant for the question of whether the change should be undertaken!)

Their formal similarity not withstanding, the justifications for using the Kaldor and Hicks criteria are very different from that underlying the efficiency approach. This is evidenced by the fact that satisfying these criteria is taken as evidence of the social desirability of a policy change. Thus, in the case of the Kaldor criterion, the fact that the losers could be compensated by a change in the tax-transfer system is taken to imply that the "social value" of the beneficiaries' gains

must exceed the "social cost" of the losers' losses. While one is certainly free to make this particular distributional judgement, there seems no compelling reason to do so.[5]

While many authors criticized the standard interpretation of the Kaldor and Hicks criteria, Little (1958) also recognized that the Hicks criterion could be justified with the efficiency logic. He proposed that a policy change was "desirable if (a) it would result in a good redistribution of wealth, and if (b) the potential losers could not profitably bribe the potential gainers to oppose the change" (p. 275). The second part of this test is the Hicks criterion (in lump sum transfer form) and was justified by the argument that if it were not satisfied, then the policy change could be dominated by lump sum redistribution and therefore should be rejected. The first part recognized that efficiency in this sense was not a sufficient condition for desirability and that a distributional judgement was necessary to go further.

In modern terms, Little's proposal can be thought of as first checking to see whether $\Delta p'$ raised social welfare and then, if it was efficient. However, under this interpretation, his proposal is problematic (see, for example, Chipman and Moore (1978)). A policy change enhancing social welfare and being efficient does not imply that there does not exist an alternative policy change yielding a higher level of social welfare. Thus, given that we must compare $\Delta p'$ with other policy changes to establish its efficiency, we might as well also ask if there exists another policy change which leads to a higher level of social welfare. In other words, if one believes that redistributions can be ranked in some meaningful way, then why not ask whether there exists some other change which delivers an even better redistribution?

To sum up, checking whether a policy change satisfies the compensation criteria of Kaldor and Hicks is similar to checking whether it is efficient. Specifically,

[5] As noted in the introduction, this judgement also gives rise to inconsistent policy recommendations. As first shown by Scitovsky (1941), it is perfectly possible for both introducing and removing a policy change to satisfy the Kaldor criteria. Similarly, it is possible for the Hicks criteria to reject both introducing and removing a policy change. This "paradox" arises when a policy change satisfies the Kaldor criterion, but fails the Hicks criterion. Intuitively, the policy change is an inefficient way of helping those whom it benefits, but removing it is an inefficient way of helping those who it hurts. In this context, it is worth noting that it is also possible for a policy change to be efficient but for removing that policy change to be efficient. This would be the case, for example, if both $p_o + \Delta p'$ and $p_o$ were "Pareto efficient policies" (see below for a definition). However, this is in no sense a paradox because the two policy changes have very different distributional consequences.

not satisfying the Hicks criterion is sufficient for a policy change to be inefficient, while passing the Kaldor criterion is sufficient for the policy change created by reversing the proposed change to be inefficient. However, the standard justification for the two criteria is not in terms of the efficiency logic, as evidenced by the fact that both tests are viewed as sufficient statistics for a policy change to be socially desirable. An exception to this is the work of Little who uses the efficiency logic to justify a criterion which combines the Hicks criterion with a distributional judgement.

### 2.4. *Relation to Modern Normative Public Economics*

Following Diamond and Mirrlees (1971), the normative public economics literature has devoted considerable attention to the characterization of second best optimal public policies. This style of analysis presupposes the existence of a social welfare function $\mathcal{W}(V_1, ..., V_n)$ and seeks to characterize the vector of policies $p^*$ that maximize $\mathcal{W}(\{V_i(p)\}_{i\in\mathcal{N}})$ subject to the constraint that $p \in \mathcal{P}$, where $\mathcal{P}$ is the feasible set of policies. More recently, however, reflecting many economists' aversion to social welfare functions, the trend in the literature has been towards the characterization of Pareto efficient policies.[6] A policy $p^* \in \mathcal{P}$ is *Pareto efficient* if there does not exist an alternative policy $p \in \mathcal{P}$ which produces a Pareto dominant utility allocation.

Under the assumption that the set of feasible policy changes is related to the set of feasible policies in the obvious way; i.e., $\Delta\mathcal{P} = \{\Delta p : p_o + \Delta p \in \mathcal{P}\}$, it is clear that the policy change $\Delta p'$ is efficient if and only if $p_o + \Delta p'$ is a Pareto efficient policy. This linkage implies that characterizations of efficient policy choices have direct relevance for the evaluation of policy changes under the efficiency approach. Checking whether a policy change $\Delta p'$ is efficient amounts to checking whether $p_o + \Delta p'$ produces a utility allocation on the second best utility possibility frontier. Accordingly, the rich set of results characterizing efficient policy choices in specific environments have direct application to the evaluation of policy changes under the efficiency approach.[7] It is in this sense that the efficiency approach fits in naturally with current practice in normative public economics.[8]

[6] Early papers in this vein are Harris (1979) and Stiglitz (1982).

[7] The environment which is best understood is that introduced by Diamond and Mirrlees (1971). This assumes that, in addition to public goods, the government can choose consumer and producer prices. Guesnerie (1995) provides a state of the art survey of what is known about efficient policies in this model.

[8] A further literature worth mentioning is that on "policy reform" (see Guesnerie (1995) for a

### 2.5. *Relation to the Theory of Cost Benefit Analysis*

The *cost-benefit approach* to policy evaluation is to compute each citizen's compensating variation associated with a policy change and recommend it if and only if the sum of these is positive. The intellectual foundation for the approach is often claimed to be the Kaldor criterion, the belief being that the sum of citizens' compensating variations being positive is a necessary and sufficient condition for this criterion to be satisfied.[9] In applications, the cost benefit approach is sometimes criticized for giving equal weight to the gains and losses of the rich as to those of the poor. In response to this problem, it is sometimes argued that the gains and losses of the poor should be given additional weight in the cost-benefit calculus. This practice was criticized by Harberger (1978) on the grounds that it might sometimes lead to the recommendation of projects benefitting the poor which were less efficient than other feasible redistributive programs.

Following the lead of Harberger (1978), Gramlich (1990) suggests classifying policy changes which benefit the poor into three groups. First, those that "pass the test for economic efficiency" (i.e., the sum of compensating variations test); second, those that "fail the test for economic efficiency, but are more efficient than any other programs in raising low incomes"; and third, those that "fail the test for economic efficiency, and are less efficient than some other program in raising low incomes" (p.116). Gramlich then argues that there is a clear case for doing projects in the first category and a clear case for not doing projects in the third category. There may also be a case for projects in the second category if helping the poor is a concern.

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comprehensive review). Given a particular status quo policy vector $p_o$, this literature addresses the problem of finding a feasible policy change $\Delta p \in \Delta\mathcal{P}$ with the property that $p_o + \Delta p$ produces a utility allocation which Pareto dominates the status quo. This is related to, but quite different from, the problem of checking whether a given policy change $\Delta p'$ is efficient. The latter requires addressing the problem of finding a feasible policy change $\Delta p \in \Delta\mathcal{P}$ with the property that $p_o + \Delta p$ produces a utility allocation which Pareto dominates that generated by $p_o + \Delta p'$. In fact, the efficiency problem in this context has been studied by Weymark (1981). In the Diamond-Mirrlees model, he seeks to identify "small" policy changes which (i) Pareto dominate the status quo and (ii) are not Pareto dominated by any other small policy changes. In developing the implications of the second condition, he effectively characterizes the set of efficient policy changes, when changes are constrained to be "small". His work therefore forms a foundation for analyzing policy changes with the efficiency approach in the Diamond-Mirrlees model when only small policy changes are feasible.

[9] In fact, because prices will typically change when redistribution takes place, this equivalence holds only under extreme assumptions (see Boadway (1974) and Blackorby and Donaldson (1990)).

In the language of this paper, what is proposed here is the use of the efficiency approach for policy changes which benefit the poor but do not pass the sum of compensating variations test. The proposal differs from what is suggested in this paper in first using the efficiency approach only when a policy change benefits the poor and second even then only as a supplement to the sum of compensating variations test. Both of these positions are problematic. First, restricting the use of the efficiency approach to changes which benefit the poor is completely arbitrary. As will be demonstrated in our second example below, policy changes benefiting the rich can perfectly well pass the sum of compensating variations test, but be inefficient. Would not the same logic suggest that there is a clear case for not undertaking such changes? Second, the continued reliance on the sum of compensating variations test means that a policy change which benefits the poor is deemed unambiguously socially desirable if the poor's benefits exceeds the rich's costs, while an outsider's value judgement is deemed necessary if the poor's benefits fall short of the rich's costs.

## 3. The Efficiency Approach at Work

This section applies the efficiency approach to three stylized examples involving the imposition of a price control, the provision of a public good, and the choice of public employment. These applications should permit the reader to understand the operation of the efficiency approach in more concrete settings, and see the types of implications it has.

### 3.1. *The Imposition of a Price Control*

There are $n$ citizens, indexed by $i \in \{1, ..., n\}$, and two goods, $x$ and $z$. Good $x$ is the numeraire and good $z$ has price $p$. Each citizen $i$ has an endowment of the numeraire or "income" $y_i$. Good $z$ is produced from $x$ by $m$ firms, indexed by $j \in \{1, ..., m\}$. For each firm $j$, the cost of producing good $z$ (in terms of the numeraire) is described by the cost function $c(z)$, where $c$ is smooth, increasing and strictly convex. The $m$ firms are owned by the citizens, with citizen $i$ owning a share $\theta_j^i \in [0, 1]$ of firm $j$. Each citizen $i$ has preferences over his own consumption of $x$ and $z$ given by the utility function $u_i(x, z) = x + \varphi(z)$, where $\varphi$ is smooth, increasing and strictly concave.

If the market for $z$ were unregulated, each firm $j$ would choose to supply an

amount $s(p)$ of good $z$ at price $p$, where

$$s(p) = \arg\max_s p \cdot s - c(s).$$

Let $S(p) = m \cdot s(p)$ denote aggregate supply at price $p$ and let $\pi(p)$ denote each firm's profits. Each citizen would choose to demand an amount $d(p)$ of good $z$ at price $p$, where[10]

$$d(p) = \arg\max_d \varphi(d) - p \cdot d.$$

Letting $D(p) = n \cdot d(p)$ denote aggregate demand at price $p$, the equilibrium price would be $p^*$ where $D(p^*) = S(p^*)$ and citizen $i$ would enjoy a utility level

$$V_i^* = \varphi(d(p^*)) - p^* \cdot d(p^*) + y_i + \sum_{j=1}^{m} \theta_j^i \pi(p^*).$$

If the government were to regulate the market by imposing a price ceiling $\rho \leq p^*$, the aggregate supply of the good would be $S(\rho)$. Assuming that this supply were divided equally among the $n$ citizens, each citizen would consume an amount $S(\rho)/n$. Citizen $i$ would then obtain a utility level

$$V_i(\rho) = \varphi(S(\rho)/n) - \rho \cdot S(\rho)/n + y_i + \sum_{j=1}^{m} \theta_j^i \pi(\rho).$$

Notice, for future reference, that $V_i(p^*) = V_i^*$.

Consider then the efficiency of a policy change under which the government imposes a price ceiling $\rho < p^*$ on the unregulated market. Suppose first that the only policy instrument that the government has available is a price control. Let $\widehat{\rho}$ denote the price control which maximizes consumers' surplus; i.e.,[11]

$$\max_\rho \varphi(S(\rho)/n) - \rho \cdot S(\rho)/n.$$

The first order condition for this problem implies that

$$\varphi'(S(\widehat{\rho})/n)/\widehat{\rho} = 1 + 1/\varepsilon(\widehat{\rho}),$$

where $\varepsilon(p)$ is the elasticity of supply at price $p$. The left hand side of this equality is decreasing in $\widehat{\rho}$, equalling 1 when $\widehat{\rho} = p^*$. Thus, roughly speaking, the divergence of $\widehat{\rho}$ from the laissez-faire price is inversely related to the elasticity of supply.

[10] I am assuming that each citizen's income is sufficient to cover the expenditure $pd(p)$ over the relevant range of prices.

[11] If this is not unique, take the largest such value.

Assuming that there is at least one citizen $h$ who owns no shares in any of the firms, imposing the price ceiling $\rho$ is an efficient policy change if and only if $\rho \in [\widehat{\rho}, p^*]$. Any price ceiling less than $\widehat{\rho}$ is inefficient, since the price ceiling $\widehat{\rho}$ both generates more consumer surplus and higher firm profits. To see that price ceilings in excess of $\widehat{\rho}$ are efficient, note that higher price ceilings lower consumer surplus and hence hurt those citizens who do not own shares. However, lower price ceilings reduce firm profits by more than they raise consumer surplus, implying that those citizens with higher than average share holdings must be worse off.

Imposing a price control in the range $[\widehat{\rho}, p^*]$ redistributes from those citizens who own the firms to those who do not. If the government has available other policy instruments which allow it to redistribute in this way, then introducing price controls might be inefficient. For example, suppose that the government can impose a tax on the firms' profits at rate $\tau$ and redistribute the proceeds via a uniform lump-sum transfer $T$. Then, imposing a price control is an inefficient policy change.

To see this, consider some price control $\rho \in [\widehat{\rho}, p^*]$ and let $\xi$ denote the increase in (per capita) consumer surplus it generates; that is,

$$\xi = [\varphi(S(\rho)/n) - \rho \cdot S(\rho)/n] - [\varphi(S(p^*)/n) - p^* \cdot S(p^*)/n].$$

Let $\tau^*$ be the tax rate which generates revenue equal to the aggregate consumer surplus increase generated by the price control; that is, $\tau^* m \pi(p^*) = n\xi$. Then, the policy change under which profits are taxed at rate $\tau^*$ and each citizen receives a cash transfer $\xi$, Pareto dominates the policy change associated with introducing the price control $\rho$.

This example illustrates two points. First, the efficiency approach has some implications (in the sense of being able to reject some policy changes) even when government has access to a very limited array of policy choices. This is illustrated by the fact that not all price controls are efficient, even when all the government can do is to impose price controls. Second, whether or not a policy change is efficient depends critically on what instruments are available. Economists are fond of saying that imposing price controls is "inefficient", but, under the efficiency approach, such a statement cannot be made without some knowledge of what else might be done. It might very well be, for example, that imposing a price control in a less developed country with a very primitive fiscal infrastructure could be efficient, while the same policy would be inefficient in a developed economy.[12]

[12] There are a number of papers investigating when price controls form part of an optimal

### 3.2. *The Provision of a Public Good*

There are $n$ citizens and two goods, a private good $x$ and a discrete public good $g \in \{0,1\}$. Citizens are endowed with the private good and the public good can be produced with $C$ units of the private good. Citizens are divided into two groups: $n_P$ "poor" citizens with endowments of good $x$ or "income" $y_P$ and $n_R$ "rich" citizens with income $y_R > y_P$. Citizens in group $K$ ($K \in \{P,R\}$) have identical preferences over the public good and their own consumption of the private good given by $x + v_K \cdot g$. It is assumed that $v_K < C$ for both groups $K$ so that no citizen has an incentive to unilaterally purchase the public good.

The government is responsible for the public good decision and, in addition, the operation of a tax-transfer system. The tax-transfer system is characterized by two parameters; a tax rate $t \in [0,1]$ and a uniform transfer $T$. Imposing the tax rate $t$ generates revenue $t(1-\delta)n\overline{y}$, where $\delta \in [0,1]$ is a parameter measuring the slippage in the tax-transfer system and $\overline{y}$ is mean income. The slippage parameter is such that $\delta < [\overline{y} - y_P]/\overline{y}$, which implies that raising the tax rate and redistributing the proceeds via the uniform transfer raises a poor citizen's utility.

The government's budget constraint is given by $t(1-\delta)n\overline{y} = nT + Cg$, implying that if the government selects a tax rate $t$ and a public good decision $g \in \{0,1\}$, the transfer must be

$$T(t,g) = t(1-\delta)\overline{y} - gC/n.$$

Thus, we can think of the government as simply selecting a pair $(t,g)$, with the transfer then being given by $T(t,g)$. When the pair $(t,g)$ is selected, citizens in group $K$ enjoy a utility level

$$V_K(t,g) = T(t,g) + (1-t)y_K + v_K \cdot g.$$

Suppose that the status quo is $(t_o, 0)$, so that the public good is not provided, and consider a policy change which involves the provision of the public good ($\Delta g' = 1$) financed by tax changes $\Delta t' \geq 0$. This change is clearly inefficient if $v_K < C/n$ for both groups $K \in \{P,R\}$, for it can be Pareto dominated by the change $(\Delta t', 0)$ which simply redistributes the costs of the public good via the transfer. Conversely, the change is efficient if $v_K > C/n$ for both groups $K \in \{P,R\}$.

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policy package. Guesnerie and Roberts (1984) establish the general desirability of quantity controls in an abstract second best model. Allen (1987), Boadway and Cuff (1999) and Guesnerie and Roberts (1987) discuss the desirability of minimum wages under various assumptions about the available alternatives.

The interesting cases arise when $v_R < C/n < v_P$ or $v_P < C/n < v_R$. In the former case, the policy change serves to redistribute from the rich to the poor. In the latter case, the redistribution may be towards the rich or the poor, depending on the way in which the good is financed. If $\Delta t' > 0$, the rich bear a greater share of the cost of the public good and hence may be worse off after the policy change even when $C/n < v_R$. Either way, the question is whether the redistribution the policy change generates would be more efficiently carried out via changing the tax-transfer system rather than through the provision of the public good.

To give the poor the same level of utility as they receive after the policy change without providing the public good would require a tax change of $\Delta t^*$, where $V_P(t_o + \Delta t^*, 0) = V_P(t_o + \Delta t', 1)$. Assuming that such a tax change exists[13] and solving this equation for $\Delta t^*$ reveals that

$$\Delta t^* = \Delta t' + [v_P - C/n]/[(1-\delta)\overline{y} - y_P].$$

The policy change is efficient if and only if $V_R(t_o + \Delta t^*, 0) \leq V_R(t_o + \Delta t', 1)$ which requires that

$$\Delta t^* \geq \Delta t' + [v_R - C/n]/[(1-\delta)\overline{y} - y_R].$$

Combining these equations reveals that the policy change is efficient if and only if

$$\overline{v} - C/n \geq \delta \cdot \overline{y} \cdot [v_R - v_P]/[y_R - y_P], \tag{3.1}$$

where $\overline{v} = [n_R v_R + n_P v_P]/n$ denotes the average valuation of the public good.[14]

Notice that this condition is independent of $\Delta t'$ and hence the way the public good is financed. The specification of utilities and the linearity of the deadweight loss of taxation imply that the utility possibility frontiers with and without the public good are linear and parallel to each other. If the above condition is satisfied, the utility possibility frontier with the public good lies to the right of the frontier without the public good. Accordingly, it is not possible to Pareto dominate any utility allocation in which the public good is provided with one in which it is not. If the condition is not satisfied, the utility possibility frontier with the public good lies to the left of the frontier without the public good. Thus, it is possible to Pareto dominate any utility allocation in which the public good is provided, provided only that there exists a point on the utility frontier without the public

[13] Necessary and sufficient conditions for there to exist such a tax change are that $t_o + \Delta t'$ exceeds $[C/n - v_P]/[(1-\delta)\overline{y} - y_P]$ and that $1 - (t_o + \Delta t')$ exceeds $[v_P - C/n]/[(1-\delta)\overline{y} - y_P]$.

[14] In deriving this condition it is helpful to note that $\overline{y}[v_R - v_P] + v_P y_R - v_R y_P = \overline{v}(y_R - y_P)$.

good which gives the poor the same level of utility.[15] In a more general model in which the deadweight loss of taxation emerged endogenously from, for example, variable labor supply, the utility possibility frontiers with and without the public good could cross and hence the efficiency of a policy change involving provision of the public good might depend on how it was financed.

Observe that when the poor have a higher valuation of the public good ($v_P > v_R$), the right hand side of (3.1) is negative. Thus, a sufficient condition for the policy to be efficient is that the average valuation of the public good exceed its per capita cost. Intuitively, this reflects the fact that the public good benefits the poor and redistributing to the poor via the tax-transfer system will entail slippage. When the rich have the higher valuation of the public good, the right hand side of the inequality is positive implying that a necessary condition for the policy to be efficient is that the average valuation of the public good exceeds its per capita cost. This reflects the fact that redistributing to the rich via reducing the tax rate avoids deadweight loss.[16]

This example is particularly useful for illustrating the differences between the efficiency and cost-benefit approaches. The sum of compensating variations test implies recommending the policy change if and only if

$$\overline{v} - C/n > \delta \cdot \overline{y} \cdot \Delta t'. \tag{3.2}$$

The left hand side represents the average surplus from the public good, while the right hand side represents the deadweight loss from a higher tax rate.

Notice that when the poor have the higher valuation of the public good, if (3.2) is satisfied then so is (3.1). Thus, if the policy change satisfies the cost-benefit test it is efficient. The converse is not true, implying that the cost-benefit test rejects efficient policy changes. This illustrates the concern in the cost-benefit literature that the standard test may give misleading guidance when projects benefit the poor.

[15] There may exist utility allocations in which the public good is provided with the property that there exists no point on the utility frontier without the public good which gives the poor the same level of utility. For example, if $C/n < v_P$ the utility allocation $(V_P(1,1), V_R(1,1))$ has this property. Such cases are ruled out by the assumption that there exists a $\Delta t^*$ such that $V_P(t_o + \Delta t^*, 0) = V_P(t_o + \Delta t', 1)$.

[16] The logic here is similar to that in Boadway and Keen (1993) who characterize Pareto efficient policy choices in a world in which there are two types of citizens and policies include a continuous public good and non-linear income taxes. Whether the public good is over-provided relative to the Samuelson condition depends on the relative marginal evaluations of the two types.

More interestingly, when the rich have the higher valuation of the public good, passing the cost-benefit test is neither necessary nor sufficient for a policy change to be efficient. That the standard test is not sufficient can be seen most easily by considering the case where $\Delta t' = 0$, so the public good is financed uniformly. In this case, the policy change benefits the rich. From (3.2), we see that the policy change passes the standard test if the average valuation of the public good exceeds its per-capita cost. However, this condition obviously does not imply that (3.1) is satisfied. This illustrates the point made in section 2.5: policy changes benefiting the rich can perfectly well pass the cost-benefit test, but be inefficient.

### 3.3. *The Choice of Public Employment*

There are $n$ citizens and three goods; a private good $x$, a discrete public good $g \in \{0, 1\}$ and labour $\ell$. The private good is the numeraire and the wage rate is denoted $\omega$. There are $m$ private firms producing the private good using labour with the technology $x = f(\ell)$ where $f$ is smooth, increasing and strictly concave. There is a single public firm which has the ability to produce the public good. The public good can be produced with a variety of combinations of labour and the private good. Let $h(\ell)$ denote the required amount of private good to produce the public good when $\ell$ units of labour are employed. It is assumed that $h$ is smooth, non-increasing and convex.

The citizens are either "workers" or "capitalists". The $n_W$ workers are endowed with a single unit of labour which they supply inelastically, while the $n_C$ capitalists each own a fraction $1/n_C$ of each of the $m$ firms. Every citizen has preferences over his private good consumption and the public good given by the utility function $u(x, g) = x + v \cdot g$.

Private firms decide how much labour to hire and output to produce. Given the wage rate $\omega$, each firm will demand an amount of labour $\ell_d(\omega)$ where

$$\ell_d(\omega) = \arg\max\{f(\ell) - \omega\ell\},$$

and earn profits $\pi(\omega)$. The government chooses whether to produce the public good and how the public firm should produce it. If the public firm employs $\ell_G$ workers, the government has a revenue requirement $\omega\ell_G + h(\ell_G)$. The government raises revenue via a proportional income tax at rate $t$ and faces the budget constraint

$$\omega\ell_G + h(\ell_G) = t \cdot [n_W \cdot \omega + m \cdot \pi(\omega)].$$

If the government provides the public good ($g = 1$) and employs $\ell_G$ public sector workers, the equilibrium wage will be given by $\omega^*(\ell_G)$ where $m \cdot \ell_d(\omega^*(\ell_G)) + \ell_G = n_W$. It is clear that higher public sector employment increases the wage rate and redistributes wealth from capitalists to workers. The tax rate necessary to balance the budget is given by

$$t(\ell_G) = [\omega^*(\ell_G) \cdot \ell_G + h(\ell_G)]/[n_W \cdot \omega^*(\ell_G) + m \cdot \pi(\omega^*(\ell_G))].$$

If the government does not provide the public good, the equilibrium wage will be $\omega^*(0)$ and taxes will be zero. Given the government's decisions $(g, \ell_G)$, it follows that each worker's utility level can be written as

$$V_W(g, \ell_G) = g[(1 - t(\ell_G))\omega^*(\ell_G) + v] + (1 - g)[\omega^*(0)],$$

while each capitalist's utility level can be written as

$$V_C(g, \ell_G) = g[(1 - t(\ell_G))m\pi(\omega^*(\ell_G))/n_C + v] + (1 - g)[m\pi(\omega^*(0))/n_C].$$

Suppose that the status quo involves the public good not being provided and consider a policy change whereby the public good is provided and $\ell'_G$ are employed in its production. This policy change necessitates imposing a tax rate of $t(\ell'_G)$. Under what conditions is it efficient?

To restrict the cases that need to be considered, assume that capitalists enjoy a higher income after the policy change than do the workers: that is, $\omega^*(\ell'_G) < \pi(\omega^*(\ell'_G))/n_C$ . This assumption implies that workers pay less than $1/nth$ of the cost of providing the public good. Since the policy change raises the wage rate and both workers and capitalists have the same valuation of the public good, it follows that the workers' utility change exceeds that of capitalists. Accordingly, if the policy change makes workers worse off, it must also make capitalists worse off.

Suppose then that the policy change makes workers better off. It will be useful to define three different levels of public employment. First, let $\ell^*_G$ be the level of public employment which maximizes aggregate consumption of the private good. Since the latter is the difference between total production of the private good and the amount used in the production of the public good, it is the case that

$$\ell^*_G = \arg\max_{\ell_G}\{mf([n_W - \ell_G]/m) - h(\ell_G)\}.$$

Thus, $\ell^*_G$ satisfies the first order condition that the marginal product of labour in production of the private good equals the marginal reduction in private good

needed to produce the public good when public employment is increased; that is, $f'([n_W - \ell_G]/m) = -h'(\ell_G)$.

Second, let $\underline{\ell}_G$ be the level of public employment which maximizes the net of tax income of the workers; that is,

$$\underline{\ell}_G = \arg\max_{\ell_G}\{(1 - t(\ell_G))\omega^*(\ell_G)\}.$$

It is straightforward to show that this level of public employment must exceed that which maximizes aggregate consumption of the private good.[17] This reflects the fact that higher levels of public employment raise the workers' wage.

Finally, let $\overline{\ell}_G$ be the level of public employment which maximizes the net of tax income of the capitalists; that is,

$$\overline{\ell}_G = \arg\max_{\ell_G}\{(1 - t(\ell_G))\pi(\omega^*(\ell_G))\}.$$

Similarly, this level of public employment must be smaller than that which maximizes aggregate consumption of the private good. At levels of public employment higher than $\ell_G^*$, lowering public employment both lowers the tax rate and boosts firms' profits through its effect on the wage.

The policy change is efficient if and only if two conditions are satisfied. First, it must make workers better off. As pointed out above, if this is not the case, it must make all citizens worse off and can therefore be dominated by the null policy change. Second, it must be the case that $\ell'_G \in [\underline{\ell}_G, \overline{\ell}_G]$. If $\ell'_G < \underline{\ell}_G$ then all citizens can be made better off by increasing public employment to $\underline{\ell}_G$, while if $\ell'_G > \overline{\ell}_G$ then all citizens can be made better off by reducing public employment to $\overline{\ell}_G$. Varying the public employment level between $\underline{\ell}_G$ and $\overline{\ell}_G$ moves the utility allocation along the utility possibility frontier with higher public employment levels generating higher utility levels for workers.

While varying the public employment level permits the government to redistribute between the two groups, it is a costly way to redistribute. Choosing any level other than $\ell_G^*$ reduces the amount of the private good available for consumption. Thus, if the government has available other policy instruments which allow it to shift resources between workers and capitalists at lower cost, then using public employment will be inefficient.

Suppose, for example, that the government can impose a wage subsidy or tax. Since workers supply their labor inelastically, this policy instrument permits the

[17] Specifically, it can be shown that $(1 - t(\ell_G))\omega^*(\ell_G)$ is increasing on the interval $[0, \ell_G^*]$.

costless shifting of resources between workers and capitalists. A wage subsidy financed by the income tax will shift resources from capitalists to workers, while a wage tax with the proceeds used to reduce the income tax will shift resources in the other direction. In this case, under the assumption that capitalists enjoy a higher income after the policy change than do workers, the policy change is efficient if and only if (i) the proposed public employment level is such as to maximize aggregate consumption of the private good conditional on producing the public good; i.e., $\ell_G = \ell_G^*$ and (ii) the aggregate value of the public good $n \cdot v$ exceeds its cost in terms of reduced consumption of the private good.

This example relates to the discussion of *production efficiency* in the optimal taxation literature. Production efficiency arises when there is no rearrangement of inputs which can generate strictly more of one consumption good, holding constant the levels of all others. In this example, when the public good is being provided, production efficiency occurs when $\ell_G = \ell_G^*$. The issue is then whether a policy change implying a departure from production efficiency is necessarily inefficient. The analysis demonstrates that it all depends on the government's ability to redistribute from capitalists to workers. This echoes the conclusions of the optimal taxation literature. In the extended Diamond-Mirrlees model in which private firms have decreasing returns to scale, Pareto efficient policy choices imply production efficiency when the government can tax the profits of different firms at different rates (Dasgupta and Stiglitz (1972) and Mirrlees (1972)). However, this implication is broken when the government does not have access to such taxes.

## 4. Objections to the Efficiency Approach

This section discusses three possible objections to the efficiency approach. The first is that it is much more difficult to implement than either the social welfare function or compensation criteria approaches. To check whether a policy change is socially desirable using the social welfare function approach the analyst need only understand the distributional consequences of the change. Using the compensation criteria approach also requires the analyst to investigate the utility allocations that might be achieved through compensation from either the status quo or the post-policy change situation. The efficiency approach requires more information still. The analyst has to investigate how the distributional consequences of the change might be achieved via other feasible policies. In principle, this requires considering variations in a multitude of spending and taxation programs and even considering the possibility of programs that are not currently in existence.

In practice, it is not going to be possible for the analyst to check into all possible alternative policy changes. Realistically, in most circumstances, the comparison of alternative changes is going to have to be limited to (i) those generated by varying the parameters of the proposed policy change (as in the price control and public employment examples) and (ii) those generated by redistribution through the tax-transfer system or other types of compensation schemes. With these restrictions, the efficiency approach is not that much more involved than the compensation criteria approach. The (implicit) assumptions made in cost benefit analysis to implement the Kaldor criterion are that the government can redistribute lump sum and that such redistribution from the status quo will not significantly alter prices. The Kaldor criterion can then be checked by analyzing the sum of compensating variations associated with the policy change. Under the same assumptions, the policy change in question will be inefficient if it generates a negative sum of equivalent variations or if there exists an alternative setting of the parameters of the proposal that yields a higher sum of equivalent variations. The only differences are (i) that equivalent variations are used rather than compensating variations and (ii) that policy changes satisfying these conditions are seen as efficient ways to achieve the distributional changes they produce, rather than as necessarily socially desirable.

The second objection concerns the difficulty of decentralizing policy decisions under the efficiency approach. One attraction of the social welfare function approach is that it is possible to define a set of shadow prices and instruct government agencies to implement any project making positive profits at those prices (see Dreze and Stern (1987) for the details). It is not obvious that this is possible under the efficiency approach, since implementing it requires more than local information about feasible policies and their consequences. An interesting problem for further research would be to investigate whether the efficiency approach might be approximately decentralized via a system of shadow prices which convey the cost of redistributing between different types of citizens.

The final objection concerns political feasibility. The efficiency approach declares policy changes which can be Pareto dominated by alternative changes the government *could* choose, to be socially undesirable. However, there is no guarantee that these alternative changes are politically feasible, in the sense that the political process would choose to implement them. Thus, it might be that the Pareto dominated policy change is the only politically feasible way of achieving the distributional changes that it produces. Is it then reasonable to label it socially undesirable?

One response to this question is to dismiss the hypothetical scenario as a serious possibility. Thus, one might argue that if politicians are interested in implementing the distributional changes produced by the policy change in question, they would certainly prefer a more efficient way of doing this. Accordingly, it would never be the case that the policy change was politically feasible, but the Pareto dominating changes were not. This line of defense is consistent with the *efficient redistribution hypothesis* familiar from the public choice literature, which asserts that political competition will ensure the selection of policies which are efficient in the sense that there are no alternative feasible policies which can achieve the same distributional gains at lower cost (see, for example, Stigler (1971) and Becker (1976)).[18]

On the other hand, if one treats the hypothetical scenario as a serious possibility, the question must be answered. The issue boils down to whether political feasibility should be taken into account by the approach; that is, should a policy change be declared inefficient only if there exists an alternative *politically feasible* policy change which Pareto dominates it?[19] It is hard to argue against taking into account political feasibility if certain policy changes are really known to be political non-starters. In such circumstances, it seems no more sensible to reject policy changes because they are dominated by such alternatives than to do so because they are dominated by alternatives that are technologically infeasible. However, political feasibility is a more slippery concept than technological feasibility. In particular, the political feasibility of a particular policy change may be endogenous to the analyst's efforts to persuade politicians about its merits.

[18]There are a number of positive theories of policy choice which support this hypothesis, Besley and Coate (1997) and Dixit, Grossman and Helpman (1997) being two examples. That said, there are also theoretical models which justify the opposite conclusion. For example, Coate and Morris (1995) show that politicians concerned about their reputations may select sneaky and inefficient methods of redistribution over more efficient transparent methods. Bullock (1995) offers an empirical test of the hypothesis in the context of U.S. farm programs.

[19]This dilemma is a familiar one to students of cost-benefit analysis. When comparing two mutually exclusive projects, standard cost-benefit practice is to deem socially desirable the project with the largest net benefit. However, many commentators have argued that the political feasibility of the competing projects should be taken into account at this stage (see, for example, Wildavsky (1966)). If the project with the largest net benefits is not likely to be selected by the political process, then these critics argue that the project with smaller (but positive) net benefits should be declared socially desirable. This scenario is a serious possibility because the net benefit criteria does not take into account the distribution of benefits and costs. Since the distributional implications of a policy tend to be a key determinant of its political fate, there is no reason to believe that the project with larger net benefits will be more likely to be selected.

Thus, to take political feasibility as a given is to deny the potential importance of the analysis in determining policy outcomes. Accordingly, the answer should depend on how "politically infeasible" an alternative actually is, which must be determined on a case by case basis.

## 5. Conclusion

The efficiency approach provides an alternative foundation for the theory of policy evaluation. It directs the policy analyst to investigate other ways of achieving the distributional changes a policy change produces, rather than to analyze whether such changes are socially desirable. This alternative focus is consonant with the trend in normative public economics to characterize Pareto efficient policies rather than those maximizing a particular social welfare function. It reflects the view that the proper role of economic analysis should be to simply inform policy-makers whether or not a policy change is an efficient way to achieve the distributional changes that it produces, rather than pronouncing on the merits of such changes.

Evaluating policy changes using the efficiency approach is significantly more involved than under standard procedures. The approach requires the policy analyst to form an assessment of the possibilities of affecting redistribution through other means. Since such redistributive possibilities will depend on the specifics of the situation, no general rules concerning the efficiency of particular types of policy changes are likely to be available. However, understanding what constitutes efficient redistribution in broader policy environments than have been considered to date will likely prove helpful in making the approach implementable.

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