A Note on the Efficiency of Income Redistribution with Simple and Combined Policies

Diskussionspapier Nr. 61-W-96

David S. Bullock
Klaus Salhofer

November 1996

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David S. Bullock, Klaus Salhofer[*]

Introduction

Comparison of the efficiencies of alternative policies has been a main topic in the agricultural economics literature since Nerlove and Wallace. Many studies in this field have concentrated on ranking what we will call *simple policies*, which are those policies using single policy instruments (for example a policy which uses a target price only, or a policy which uses a production quota only). More recent studies have also investigated the efficiencies of *combined policies*, which we define as those using several instruments simultaneously (for example, a policy which uses a target price and a production quota). Several of these latter studies find that optimal combination of two policy instruments is more efficient than using either of the instruments independently. In this short note we show using set theory and maximization theory that these findings are examples of a more general result, which is that making additional policy instruments available to government allows for the attainment of a more efficient policy. That is, a policy combining m instruments efficiently will always be at least as efficient as any policy using a subset of those m instruments. This general result is, once realized, intuitively appealing and even rather obvious. But while so far in the literature several specific examples of this result have been presented, the generality of the result has not been recognized or appreciated.

[*] David S. Bullock, Associate Professor, Department of Agricultural and Consumer Economics, University of Illinois, e-mail: dsbulloc.uiuc.edu.
Klaus Salhofer, Research Associate, Department of Economics, Politics, and Law, Universität für Bodenkultur Vienna, e-mail: salhofer@edv1.boku.ac.at

Senior authorship is not implied.

Studies of Combined and Simple Policies

In this section we briefly review several studies which have compared the efficiencies of combined policies and simple policies. These studies all present specific examples of a policy combining two instruments efficiently being superior to policies using either of the instruments independently.

Output Subsidies and Production Control

Just discussed the efficiencies of the simple policies output subsidization (or equally a target price/deficiency payments policy) and production control, and of a combination of the two simple policies. Just's study used a stochastic setting (uncertainty in producer and consumer prices). He theoretically and empirically showed that "the joint use of [target price/]deficiency payments and production controls clearly dominates use of either one individually" (p. 58) when government's objective is either to maximize a weighted social welfare function (SWF) or to maximize social welfare subject to a given welfare (income) ratio between producers and consumer/taxpayers.

Similarly, Innes and Rausser, and Innes proved in a different stochastic setting (uncertainty in producer price and production) and based on a weighted social welfare function, that "production control is . . . an optimal complement to a target price[/deficiency payments] program" (Innes, p. 53).

Alston and Hurd analyzed the effects of the excess burden of taxation on the efficiency ranking of alternative policies using the normative criterion of "minimizing the total costs to consumers and taxpayers of achieving a given increase in producer surplus" (p. 150).[1] They

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[1] Note that this is the same as maximizing the welfare of consumers and taxpayers subject to a given producer welfare.

discussed that "it is always inefficient to specialize in either a[n output] subsidy or a production control for the case "when the [social] opportunity cost is one dollar per dollar of government spending" (p. 150). They also proved for the case in which there is an excess burden of taxation that "[t]he combined quota and output subsidy policy remains superior to the output subsidy alone" (p. 153).

Output Subsidies and Export Subsidies

Gardner (1988) discussed for a small country that a combination of output subsidies (a policy which sets a certain price to producers) and export subsidies (a policy which sets a certain price to producers and consumers) is preferable to either of the simple policies alone if government's objective is to maximize a weighted SWF with different weights to producers, consumers and taxpayers. A similar result was derived by Alston, Carter and Smith (1993) who showed that when government attaches a higher weight to taxpayers than to consumers because of the presence of excess burden of general taxation, any amount of transfer to producers can be achieved more efficiently (i.e., at lower social costs) by combining output subsidies and export subsidies than by using output subsidies alone.[2] In addition Alston, Carter and Smith (1993) showed that in the large country case, using a combination of output subsidies and export subsidies may increase efficiency compared to using output subsidies alone.

Tariff and Production Control

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[2] In fact, Gardner discussed a combination of deficiency payments and consumption tax, but as shown by Alston, Cater and Smith (1995), this is consistent with what Alston, Cater and Smith (1993) called a combination of output subsidies and export subsidies.

Guyomard and Mahé showed using a static general equilibrium framework that in the case of a small country importer, "the level of [social] utility under a production quota with a tariff is greater than the level of [social] utility under a simple tariff" (p. 34).

Price Support and Research Expenditures

De Gorter, Nielson, and Rausser used a weighted social welfare function approach to show that combining research expenditures and output subsidies can improve social welfare compared to levels achievable using research expenditures alone (p. 34). Gardner (1992) confirmed this finding for the case of a large country. He also showed that this finding does not "depend upon farmers being economic losers from technical progress" (p. 14) as hypothesized by Tweeten and Coggins. Similarly, de Gorter and Swinnen showed that a joint use of research expenditures and export subsidies increases social welfare subject to a minimum producer welfare constraint.

The General Case: Increasing the Number of Available Instruments Cannot

Decrease (and Often Can Increase) Efficiency

Following (*reference omitted*) let $\mathbf{x} = (x_1, \ldots, x_m)$ be a vector of policy instrument variables available to government. A particular value of $\mathbf{x}$ is called a "policy". Let $\mathbf{u} = (u_1, \ldots, u_n)$ describe welfare levels of n interest groups affected by government policy. Groups' welfare levels are functions of government policy $\mathbf{u} = (u_1, \ldots, u_n) = (h_1(\mathbf{x}), \ldots, h_n(\mathbf{x})) = \mathbf{h}(\mathbf{x})$.

Let X be the set of feasible policies (where by feasible we mean technically feasible, though not necessarily politically feasible). Then $F = \{\mathbf{u} \mid \mathbf{u} = \mathbf{h}(\mathbf{x}), \mathbf{x} \in X\}$ is the set of feasible policy outcomes. Now let us examine the effects of one of the *m* policy instruments of X being constrained to a particular value, for example let us constrain x_m to be fixed at some level x_m'. (This level may be a level at which the instrument is not effective, such as when

production control is set at a very high positive number, so that it never affects actual

production, or such as when a tax is set at zero. What is the same, one can simply assume that

x_m is not available.) The new set of feasible policies may then be defined as $X' = \{\mathbf{x} \in X \mid x_m = x_m'\}$. Clearly $X' \subset X$; the new set of feasible policies is a subset of the original set of feasible

policies. Therefore it must be that the new set of feasible policy outcomes is a subset of the

original set of feasible policy outcomes: $F' = \{\mathbf{u} \mid \mathbf{u} = \mathbf{h}(\mathbf{x}), \mathbf{x} \in X'\} \subset F = \{\mathbf{u} \mid \mathbf{u} = \mathbf{h}(\mathbf{x}), \mathbf{x} \in X\}$. That is, any policy outcome achievable when only a subset of the *m* original instruments is

available is also achievable when all *m* instruments are available. (For a government could

always choose not to use some of the available instruments.) But conversely, there can be

policy outcomes achievable with all *m* instruments which are not achievable with any subset of

those *m* instruments. *Therefore, no matter the definition of "efficiency" (or "social welfare")*

used, making fewer policy instruments available cannot increase, and may decrease efficiency

(or social welfare).

To examine the points made above in more depth and see how they relate to the

literature, let W: $\mathbf{u} \rightarrow R$ describe government's objective function (or a social welfare function,

or some function measuring "efficiency," however defined). Let con[$\mathbf{h}(\mathbf{x})$] represent an

optional constraint equation or inequality involving the welfare measures of interest groups.

Let government's (or society's) decision problem be given by:

(1) $\underset{\mathbf{x} \in X}{\text{Max}} \left\{ W\big(\mathbf{h}(\mathbf{x})\big) \quad \text{s.t.} \quad \text{con}\big[\mathbf{h}(\mathbf{x})\big] \right\}.$[3]

Hence the problem might be to maximize the sum of welfare of producers, consumers, and

taxpayers subject to a given welfare ratio between producers and consumers/taxpayers, as in

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[3] In accordance to the reviewed articles and normative economics in general government's decision problem is assumed to be welfaristic, i.e. depends solely on individuals (or groups) welfare.

Just; or the problem might be to maximize the welfare of consumers and taxpayers subject to having producers achieve some given welfare, as in Alston and Hurd; or the problem might be to maximize a weighted linear social welfare function under no constraint, as in de Gorter, Rausser and Nielson.

Now let us examine the effects of one (or more) of the *m* policy instruments of X being constrained. Again, we assume that x_m must be fixed at some level x_m'. Then government's problem is

$$(2) \quad \underset{\mathbf{x} \in X' \subset X}{\text{Max}} \left\{ W\big(\mathbf{h}(\mathbf{x})\big) \quad \text{s.t.} \quad \text{con}\big[\mathbf{h}(\mathbf{x})\big] \right\}$$

A policy $\mathbf{x}^*$ found by solving the maximization problem (1) is said to be at least as efficient (or politically desirable, or socially desirable, etc.) as policy $\mathbf{x}^{*\prime}$ found by solving (2) if $W(\mathbf{h}(\mathbf{x}^*)) \geq W(\mathbf{h}(\mathbf{x}^{*\prime}))$. Because the choice vector $\mathbf{x}$ in (2) must be chosen from $X' \subset X$, and the choice vector $\mathbf{x}$ in (1) can be chosen from X itself, the maximization problem (2) is more constrained than is the maximization problem in (1). It follows that for any policy $\mathbf{x}^{*\prime}$ that solves (2), a policy $\mathbf{x}^*$ can be found that solves (1) such that $W(\mathbf{h}(\mathbf{x}^*)) \geq W(\mathbf{h}(\mathbf{x}^{*\prime}))$. Therefore a government that can choose the levels of *m* policy instruments must be able to attain policy outcomes that are at least as efficient (socially desirable, politically desirable, etc.) as those it can attain if it only has a subset of those *m* policy instruments available (or if one or more of the *m* policy instruments are fixed at certain levels).

Conclusions

Many of the papers we have quoted analyzed the conditions under which use of two policy instruments is more efficient than using either of the instruments independently. Nothing in our

analysis says that it will always be optimal to use all policy instruments available.[4] But our

analysis does show that it cannot hurt to make more instruments available for use (and for

most cases it is safe to say that having more instruments available is superior to having fewer).

This general point has remained widely unrecognized in the literature, with several studies

concluding only after extensive theoretical and/ or empirical analysis that better results can be

attained by using two than by using only one. Some studies have found results of combined

policies being less efficient than single policies. These studies failed to consider optimal

combinations.[5]

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[4] The answer to this question can depend on the market conditions (e.g. demand and supply elasticities), the government (social, political) objective function the consideration of multimarket effects, uncertainty, or dynamic effects.

[5] For example Innes and Rausser (p. 928) found that the socially optimal target price policy dominates any target price program with acreage controls. Gisser found that a combination of target price and acreage controls more efficient in the case of corn, wheat, rice, and cotton but less efficient in the case of feed grains.

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