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Interventions and Production Sector Waste in LDC Agriculture

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Recent studies have revealed that less developed countries (LDCs) have been taxing their agricultural sectors at rates of 40–50%. This study uses quantity-based general equilibrium measures of deadweight loss to evaluate the cost of these distortions in 18 of these countries. The Allais–Debreu loss measures indicate that from 7–16% of either output or of the agricultural resource base has been wasted due to the associated misallocation of agricultural inputs across these countries.

Key words: agricultural taxation, deadweight loss, LDC agriculture.

Introduction

Agriculture is heavily taxed in less developed countries (LDCs), with combined direct and indirect tax rates of 40 to 50% being common. These levels of intervention surely have had significant impacts both on the allocation of resources to agriculture and on the productivity of those resources. This article characterizes the social cost of these distortions in terms of the general equilibrium measures of deadweight loss introduced by Allais (1943, 1977) and by Debreu. Empirical estimates of these deadweight losses are derived for 18 developing countries over the period 1960 through 1984. The interventions to which losses are attributed include sector-specific policies and general trade and exchange rate policies.

Measures of Waste Due to Distortions

We first address the issue of how to conceive and measure the net costs of price-distorting interventions. The two families of general equilibrium methods used to measure waste due to distortions consist of the quantity-oriented approaches, which originated with the works of Allais (1943, 1977) and Debreu, and the price-oriented approaches, which originated with the works of Hicks and Boiteux.

The essence of the Allais–Debreu quantity-oriented approach is to measure the quantity of a good or basket of goods that could be discarded as surplus without reducing the welfare of any individual, if the distortion were removed and optimal reallocation were to occur. The essence of the Hicks–Boiteux price-oriented approach is to first find a welfare-maximizing Pareto-optimum reference equilibrium, and then to measure the sum of compensating variations in consumers' incomes for that allocation relative to the distorted one. The Allais–Debreu approach, which we utilize in this study, can be thought of as an efficiency measure since it does not address the issue of how the surplus is to be distributed

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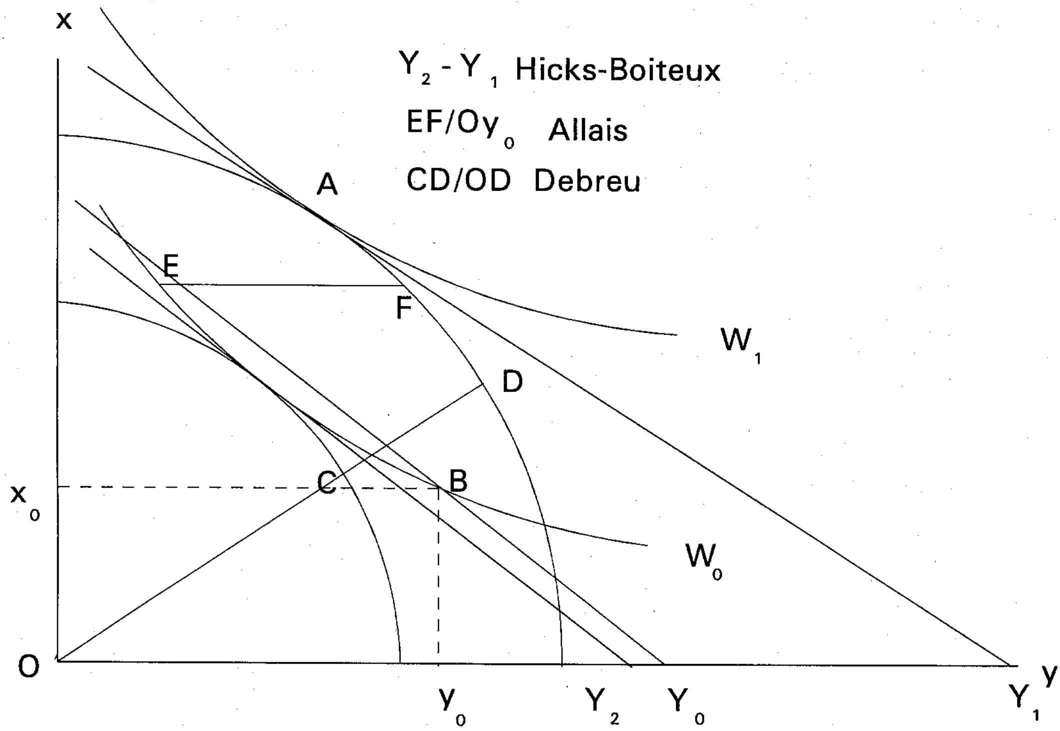

Figure 1. Hicksian, Allais, and Debreu measures of waste at initial point *B*

or what metric is to be used for the improvement in consumer welfare. The Hicks–Boiteux approach is a more complete welfare analysis, with the attendant difficulty of specifying a social welfare function.

The difference between these approaches can be illustrated for a two-good economy in the output space of figure 1. Consider the distorted economy that is in equilibrium at point *B* (point *B* as an equilibrium could be supported by differentially distorted input prices across producers, for example). The Hicks–Boiteux approach measures waste due to a distortion as the difference between aggregate income at the distorted equilibrium and aggregate income at a Pareto optimal reference equilibrium, using the reference equilibrium prices in both cases. Given a social welfare function (W), the reference equilibrium in figure 1 is point *A*, which generates welfare (W_1), as compared with the distorted equilibrium point *B*, which generates the lesser welfare level (W_0). If good y is taken as the numeraire good, the Hicks–Boiteux measure of waste due to the distortion is the distance, Y_1–Y_2, which is the amount of income equivalent to the increase in welfare from W_0 to W_1, evaluated at reference equilibrium prices. This total amount of waste can be decomposed into two components. Waste in the producer sector is Y_1–Y_0, because optimal reallocation within the producing sector alone could have generated this amount of income, with goods evaluated at reference prices. Waste in the consumer sector is Y_0–Y_2, because the initial level of welfare (W_0) could have been realized with this much less income.

Allais (1977, p. 113) defines a general equilibrium measure of deadweight loss as the concept of distributable surplus. In his words:

> In a given situation, the maximum distributable surplus of *any good whatever*, for *a given group of operators* (consumption or production units) disposing of given resources, may be defined as the maximum quantity of this good which can be made available subject to the triple condition (i) that all the indexes of preference of the consumption units in the group maintain values which are at least equal to those they had in the situation considered; (ii) that the resources used remain at levels which are at most as high as in the initial situation; and (iii) that the production this group makes available to the rest of the economy is at least equal to what it supplied in the initial situation. [emphasis added]

In the context of our later analysis, the "group of operators" consists of the agricultural production firms in the set of countries we examine. If commodity y in figure 1 is the reference good, then the Allais distributable surplus measure is vector EF. Subsequently in this article, we will normalize this measure and express it as a fraction of the initial distorted-equilibrium quantity of the good, i.e., as EF/Oy_0 in figure 1.

Debreu proposed to measure waste not as the amount of a single good that could be discarded without making anyone worse off, but as the maximum fraction of the *resource bundle* that could be so discarded. (His well-known *coefficient of resource utilization* is the smallest fraction of the actually available physical resources that would permit the achievement of the initial satisfaction level for each consumer.) The Debreu measure of loss as we use it in this study is the fraction of physical resources that can be discarded (1.0 minus the coefficient of resource utilization). Thus, while the Allais loss is measured as the fraction of the initial amount of a particular commodity, the Debreu loss is measured as the fraction of the initial basket of resources. In figure 1, if D represents the initial basket of resources, this version of the Debreu loss is measured by the distance ratio CD/OD.

While the Hicks–Boiteux approach requires specification of an entire welfare function so as to establish a reference equilibrium (point A), it is evident from figure 1 that the Allais and Debreu approaches also require specification of the constant utility allocation curve similar to the welfare indifference curve W_0. This curve represents the minimum combinations of goods x and y which, when optimally reallocated among consumers, allow all consumers to be kept at their initial satisfaction levels. Empirical specification of such a curve is conceptually measurable from market behavior, but this would require substantially detailed knowledge about individual consumer preferences. This knowledge of W_0 can be circumvented if we focus solely upon Allais' *production sector loss* (following Diewert), defined as the amount of a good or goods that can be extracted from the production sector while preserving the initial production (and consumption) bundle B.

The Allàis and Debreu versions of production sector waste, defined as surpluses available while maintaining the current production-consumption bundle (as opposed to the lesser constraint of maintaining current levels of consumer satisfaction) are shown in figure 2 as vectors BH/Oy_0 (Allais production sector waste) and GD/OD (Debreu production sector waste). It is clear that in figures 1 and 2 the production sector waste is less than total waste (BH is less than EF, and GD is less than CD).

In this study, we examine Allais and Debreu quantity-oriented measures of waste in the agricultural production sectors of a set of LDCs. We measure the quantity of good(s) that could be extracted by a reallocation within the production sectors while maintaining the current output bundle. The advantage of examining *only production sector* waste is that we do not have to evaluate how to redistribute among consumers so as to keep them at their current satisfaction levels. The advantage of the *quantity-oriented measures* relative to the price-oriented measures is that we do not have to evaluate how to redistribute the surpluses among consumers in a welfare-maximizing way. The deadweight loss measures we examine facilitate consistency of empirical analysis with theoretical concepts, but they are conceptually an incomplete measure of the total deadweight loss. If these measures are big, they might warrant the cost associated with policy reform and consequent income redistribution.

Measures of Waste Due to Price Distortions in LDC Agriculture

In this study, we wish to measure the waste due to the extensive agricultural price distortions that have been evaluated by Valdes and others for 18 LDCs. The total deadweight losses due to these interventions arise because of the resulting misallocation of resources among the countries and between the agriculture and nonagriculture sectors of each. Measurement of the Hicks–Boiteux loss would require us to specify welfare functions that would allow us to determine how the fruits of efficiency gains should be reallocated among

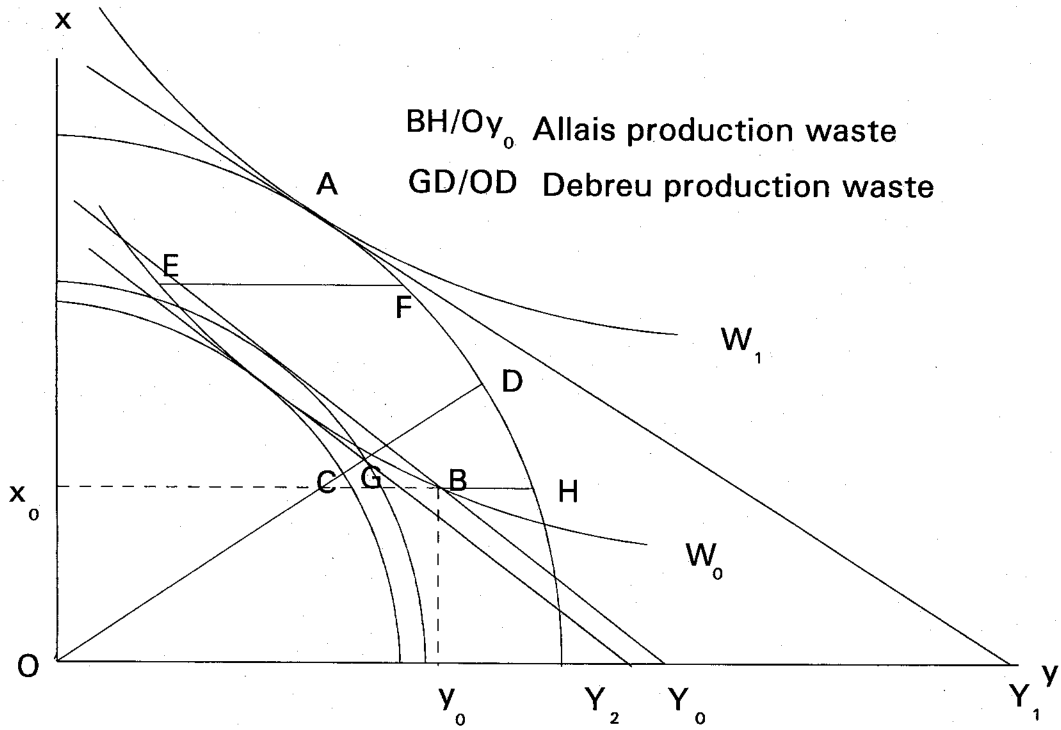

Figure 2. Allais and Debreu measures of producer sector waste at initial point *B*

the consumers of the various countries, a task too formidable for us even to contemplate. Allais and Debreu loss measures avoid this necessity, but still would require information about production tradeoffs between agricultural and nonagricultural sectors of each country; in addition, they would require information necessary to approximate the welfare function W_0, which is also a formidable undertaking, as suggested above. Thus we are led to empirical estimates of a measure of only producer sector loss due to the price distortions—a loss measure that is of less interest than full deadweight losses, but one that is empirically feasible. We pursue it in this study as a step along the road toward a more complete evaluation of the waste due to interventions in agricultural prices.

Allais–Debreu measures of production sector loss involve the quantities of commodities or resources that can be extracted from the production sector (the aggregated agricultural sectors, in our case) by reallocating within the production sectors while maintaining output available for consumption and without increasing total input use. Evaluation of these losses requires knowledge of inter-country tradeoffs in agricultural production, along with initial levels of inputs and output. For this study, we use the Fulginiti–Perrin cross-country production function that was estimated for these 18 countries. That production function specified aggregate agricultural output as a function of land, livestock, machinery, fertilizer, and labor, with the production elasticities being a function of "technology-changing variables" such as research, human capital, and past prices. If the inputs that are tradable (fertilizer, for example) are not employed outside agriculture, and if the amounts of nontradable inputs (land and labor, for instance) are not responsive to the price or use of tradables, then the estimated production function implies a transformation surface defined over the output of the various countries, holding nontradable inputs fixed by country and reallocating tradable inputs to trace out the transformation surface. This surface is the n-dimensional analog of figures 1 and 2.

For a two-country analog of the 18-country analysis to follow, consider x and y of figures 1 and 2 to be homogeneous agricultural output from each of two countries, with the production possibilities curve representing levels that could be produced by allocation of tradable inputs between the two agricultural sectors. The initial equilibrium is at point B because producers in the two countries face different input/output price ratios due to different price distortions. The Allais measure of loss that we evaluate is the maximum scalar fraction of aggregate agricultural output that could be discarded, σ. In the two-dimensional analog of figure 2, the iso-revenue lines have slope -1 so that aggregate output is measured along the horizontal axis as $Y = x + y$. The geometric interpretation of σ in that figure is the ratio of Y_0Y_1 to OY_0.

In the empirical analysis of the 18 LDCs, we use a programming algorithm to identify the reference equilibrium point corresponding to point A in figure 2. The programming problem is to maximize σ, the fraction of initial production discarded, by reallocating tradable resources, subject to the individual countries' production functions (corresponding to the production possibilities curve in fig. 2), and subject to the constraint that nondiscarded output is at least as great as the initial aggregate output (i.e., OY_0 in fig. 2).

The Debreu measure of loss we evaluate is λ, the maximum fraction of the bundle of nontradable resources that could be discarded while maintaining total output. In the two-dimensional analog of figure 2, λ is represented by the ratio of GD to OD. The programming algorithm used to identify point G maximizes the scalar fraction of all nontradable inputs to be discarded (λ) by reallocating tradable inputs subject to the production functions and to the constraint that total output remains at least at the initial output.

Given the Fulginiti–Perrin production function (to be described in detail in the next section) and given the aggregated quantity of each input, the nonlinear programming problems that identify the two measures of waste are those that follow, where j subscripts represent countries, l subscripts represent nontradable inputs, and i subscripts represent tradable inputs.

- Allais measure of distributable surplus, σ:

(1)
$$\max_{x_{ji}} \sigma$$
$$\text{s.t.:} \quad y - \sigma y^0 \geq y^0,$$
$$z_{jl} = z_{jl}^0, \qquad \forall\, j, l,$$
$$\sum_j x_{ji} \leq \sum_j x_{ji}^0, \qquad \forall\, i;$$

and

- Debreu measure of loss, λ:

(2)
$$\max_{x_{ji}} \lambda$$
$$\text{s.t.:} \quad y \geq y^0,$$
$$z_{jl} - \lambda z_{jl}^0 = z_{jl}^0, \qquad \forall\, j, l,$$
$$\sum_j x_{ji} - \lambda \sum_j x_{ji}^0 \leq \sum_j x_{ji}^0, \qquad \forall\, i,$$

where

$y = \Sigma_j\, y_j$, with y_j being defined by the production function of equation (3) evaluated at country averages, i.e.,

$$y_j = \exp[\alpha_0 + \Sigma_k\, \alpha_k T_{jk} + \Sigma_i\, (\gamma_{i0} + \Sigma_k\, \gamma_{ik} T_{jk}) x_{ji} + \Sigma_l\, (\gamma_{l0} + \Sigma_k\, \gamma_{lk} T_{jk}) z_{li}],$$

and T_{jk} is the average over time of τ_k in country j;

z_{jl} = level of x_{ji} for nontradable input l in country j;

x_{ji} = level of x_{ji} for tradable input i in country j;

Table 1. Agricultural Protection and Growth Rates, 18 Countries

Country	Years	NPR[a] (%)	Production Growth[b] (%)
Argentina	61–84	−40	2.1
Brazil	69–83	−13	3.8
Chile	61–83	−25	1.8
Colombia	61–83	−33	2.8
Dominican Republic	66–85	−40	2.8
Egypt	64–84	−53	2.7
Ghana	58–76	−24	1.1
Ivory Coast	61–82	−53	5.2
Korea	61–84	16	4.2
Malaysia	61–83	−18	3.3
Morocco	63–84	−34	4.0
Pakistan	61–84	−47	3.8
Philippines	61–82	−32	3.8
Portugal	61–83	−18	−.1
Sri Lanka	61–85	−49	2.1
Thailand	61–84	−41	4.7
Turkey	61–83	−36	2.8
Zambia	66–84	−53	2.2

[a] NPR, the nominal protection rate, is defined as (domestic price/border price) − 1, with domestic price adjusted for exchange rate misalignment and price distortions for industry.
[b] Average annual growth rate, calculated from FAO production indexes.

$y^0 = \Sigma_j y_j^0$; and

$y_j^0, z_{jl}^0, x_{jl}^0$ = averages over time of output and input levels for each country.

Both of these measures reallocate the existing levels of tradable agricultural resources among the 18 countries so as to maximize the objective functions, with total output as determined from the production function evaluated for any given country at average (over time) levels of nontradable inputs and technology-changing variables.

Empirical Evaluation of Loss Measures

The Fulginiti and Perrin cross-country agricultural production function was estimated for the set of 18 countries for which recent World Bank studies had made available new data on the level of agricultural price distortions. Their study, similar to a series of other studies in the Hayami and Ruttan tradition, augmented a Cobb–Douglas production function in traditional variables with "technology-changing variables" such as education, research investments, and past price levels. While their objective was to examine the productivity effects of price policies, the production function and variables provide the basis for examining the allocative losses from these policies, which is the focus of the present study. A listing is provided in table 1 of the countries and years for which data were included, along with the average nominal protection rates for each country, which averaged about −36%.

The production function estimated by Fulginiti and Perrin consisted of an augmented Cobb–Douglas function of the form

$$\log(y) = \alpha_0 + \sum_k \alpha_k \tau_k + \sum_i \gamma_{i0} \log(x_i) + \sum_i \sum_k \gamma_{ik} \tau_k \log(x_i), \quad (3)$$

Table 2. Definitions of Variables Used in the Analysis

Variable	Description
Output (y)	Value of agricultural production in millions of 1980 "international" dollars.*
Land (x_1)	Thousands of hectares of arable and permanent cropland and permanent pastures.
Livestock Capital (x_2)	Number of cow equivalent livestock units calculated using the procedures of Hayami and Ruttan.
Machinery (x_3)	Agricultural tractors and garden tractors (FAO) in thousands of horsepower units, aggregated according to the procedures of Hayami and Ruttan.
Fertilizer (x_4)	The sum of nitrogen, potash, and phosphate content of various fertilizers consumed, measured in thousands of metric tons in nutrient units.
Labor (x_5)	Thousands of participants in the economically active population in agriculture.
Past Output Price (τ_1)	Five-year moving averages of Tornquist indexes of past prices received for major agricultural products.
Wages (τ_2)	Five-year moving averages of past monthly wages in U.S. dollars paid to agricultural workers.
Fertilizer Prices (τ_3)	Five-year moving averages of an index of past prices paid for fertilizer (nitrogen, potash, and phosphate).
Agricultural Research (τ_4)	Stock of agricultural research, measured with a five-year inverted-*V* lag structure to accumulate annual research expenditures in thousands of 1980 U.S. dollars.
Land Quality Index (τ_5)	Peterson's (1987) international land quality index.
Human Capital (τ_6)	The gross enrollment ratio for primary schools.

* "International" dollars are obtained from Food and Agriculture Organization (FAO) data, using the Geary–Khamis price index with the purpose of aggregating agricultural products for international comparison. The international average prices of agricultural commodities are determined simultaneously with the exchange rates of the national currencies in such a manner that the calculated exchange rates equalize the purchasing power of national currencies with respect to the defined groups of commodities.

where y is output, x_i is the level of the ith input, τ_k notations are levels of "technology-changing variables," and α and γ denote fixed coefficients. Thus, this production function exhibits a variable elasticity of production with respect to each of the traditional input variables x_i. The technology-changing variables (τ_k) determine production elasticities and are considered by the decision makers to be parameters for the current production period.

The variables used in the production function study are identified and defined in table 2. The data are described in more detail in Fulginiti and Perrin and were made available in full for the present study in Elisiana, Fulginiti, and Perrin. The 22 parameter estimates reported by Fulginiti and Perrin are presented in table 3. Estimated production elasticities for the traditional inputs, evaluated at the average values of the variables, were .25 for labor, .25 for land, .21 for machinery, .18 for fertilizer, and .17 for livestock capital. The sum of these coefficients is 1.06, closely approximating constant returns to scale.

This production function permits us to evaluate the two measures of deadweight losses due to any misallocation of resources across these agricultural sectors. While we cannot specify exact causes of these misallocations, the differential price interventions mentioned above would be significant and perhaps sufficient causes. Given the production function as estimated in table 3, a production function in traditional inputs specific to each country can be evaluated by inserting average values of the technology-changing variables for that country. This yields a Cobb–Douglas production function in the five traditionally-measured inputs for each country, as specified in the nonlinear programming problems described by equations (1) and (2). The Allais and Debreu measures of waste due to cross-

Table 3. Cross-Country Agricultural Production Function [equation (2)] Reported by Fulginiti and Perrin, Estimated for 18 Countries

	Land	Livestock	Machinery	Fertilizer	Labor	Intercept (α_0, α_k)
Linear Terms (γ_{i0})	.040 (.083)	.146 (.114)	.173 (.061)	.093 (.051)	.838 (.093)	−1.964 (.652)
Past Output Price (γ_{i1})	.527 (.044)	−.554 (.054)	.064 (.030)	−.019 (.024)	.231 (.048)	−2.266 (.336)
Past Wage Levels (γ_{i2})					−.011 (.003)	
Past Fertilizer Price (γ_{i3})				.006 (.006)		
Research (γ_{i4})	.011 (.016)	.041 (.022)	.005 (.013)	.022 (.009)	−.140 (.017)	.523 (.119)
Land Quality (γ_{i5})	.054 (.007)					
Schooling (γ_{i6})					.040 (.009)	

Notes: Estimates are based on 410 observations from 1961–85; standard errors are in parentheses; overall R^2 = 0.94.

country misallocation of tradable resources will depend upon which resources are considered tradable. It seems clear that fertilizer is in the category of tradables, even in the short run. In the longer run, machinery also might be considered tradable. We therefore solve problems (1) and (2) under both sets of assumptions, using the MINOS algorithm within the GAMS software package.

Optimum values of the objective functions for these problems are reported in table 4. The Allais measure of waste indicates that in the short run, an additional 7.5% of output could have been produced with the same level of resources, with a comparable long-run figure of 16.7%. These fractions of total output could be "liberated" after reallocation of resources, leaving all consumers at current levels of consumption of agricultural products. The Debreu measures are similar at 7.4% for the short run and 14.4% for the long run. The Debreu loss measures represent the fractions of the resource base that could be extracted without reducing total output from the combined production sectors.[1]

It is useful at this point to compare our results with those of Peterson (1979), who made an empirical estimate of the social cost of cheap food policies in 27 LDCs for the years 1963 and 1969, using an approach that is in some sense comparable to a Hicks–Boiteux general equilibrium welfare measure. Peterson measured loss as the welfare triangle between Marshallian demand and supply curves within countries in which food prices were held below equilibrium levels (world price) by unspecified policy mechanisms. He estimated the deadweight loss in this manner to be equivalent to 3.76% of the countries' aggregated national income. Our estimates, by contrast, are equivalent to 1–3% of aggregated national income.[2] Peterson's measure would be a Hicks–Boiteux deadweight loss if consumers are identical, if equal welfare weights apply to all consumers, and if the food demand and supply curves are "general equilibrium" curves (i.e., if they are generated by a wedge of varying size in the food market with all other prices responding in a general equilibrium framework).

A significant weakness of the Peterson approach is that the Marshallian curves are not necessarily consistent with these assumptions, and as the assumptions are relaxed, the conceptually clear interpretation of the triangle as a Hicks–Boiteux deadweight loss measure is, to an unknowable degree, no longer warranted. On the other hand, a significant weakness of our approach, as stated earlier, is that while our measures are conceptually clear and consistent with the data being considered, they are incomplete measures of the total social deadweight loss. In a sense, then, the two approaches complement one another

Table 4. Measures of Production Sector Waste Due to Inefficient Inter-Country Allocation of Tradable Agricultural Inputs

Set of Tradable Inputs	Allais' Loss Measure (σ)	Debreu's Loss Measure (λ)
Fertilizer	.0756	.0736
Machinery and Fertilizer	.1670	.1441

in providing estimates of similar magnitude that support the conclusion that the deadweight costs of interventions in these countries have not been trivial.

Our estimates of deadweight allocative losses are subject to other limitations and errors as well. The data are from sources widely used by other researchers for the most part, but they are nonetheless in some cases probably little better than "guesstimates" produced by international organizations on the basis of limited information. Apart from these errors in measurement, the production function coefficient estimates entail substantial sampling error as well as unknown specification error. Unfortunately, we have no statistical tests of the significance of our measures of deadweight loss, since the programming results cannot be represented as functions of the statistically estimated parameters.

Our procedures also assume away transportation costs and assume inputs to be homogeneous, creating overestimates of the losses to the extent that the assumptions are false. Given a sufficient length of run for adjustment, however, it seems plausible to us that transportation costs could be considered negligible and that they might well not be increased much by the reallocations. It seems similarly plausible to us that in the long run, a one-horsepower unit of machinery could be considered nearly homogeneous because total production and distribution costs may not differ significantly for the new allocation, even though the horsepower units might be embodied in different tractor packages.

While such limitations as these suggest caution in the interpretation of the point estimates of loss, the importance of the policy issues warrant our best efforts at empirical measurement. We have as yet to find avenues for further improvement of the data.

Summary and Conclusions

In this study, we have examined the size of allocative deadweight losses due to price interventions in LDC agricultural sectors. The extent of effective agricultural price taxation, ranging to over 50% and averaging over 30% in the countries we examined, is cause for concern about its effect on the performance of these agricultural sectors. We develop modifications of the general equilibrium deadweight loss measures advanced by Allais and Debreu to measure the losses in the production sector due to these interventions. Our results indicate that in the short run (with only fertilizer tradable), the deadweight loss is equivalent to about 7.5% of either output or resources. In the longer run (with both fertilizer and machinery tradable), the estimates rise to 16.7% and 14.4%, respectively.

Our variations from the original Allais and Debreu concepts of general equilibrium loss measures are substantial. We examine only production sector losses, and even those under the assumption that inputs are not traded between agricultural and nonagricultural sectors, but rather only between agricultural sectors. These restrictions are necessary because of the difficulty of obtaining information about inter-sectoral and intra-consumer tradeoffs within each country that would be necessary to evaluate the full general equilibrium losses. The restrictions result in deadweight losses that are conceptually smaller than the associated measures of loss introduced by Allais and Debreu. Our measures are useful because they allow a consistency between theoretical concepts and simple empirical analysis that is not available with the approaches of Hicks and Boiteux or Allais and Debreu. If our measures happen to be large, then they suggest correspondingly large benefits from policy reform.

Our estimates of the deadweight losses due to the allocative effect of price interventions have a number of limitations. They are incomplete in that we do not consider general equilibrium effects of exchange among the agricultural sectors, consumers, and other productive sectors. Conceptually, our measure of inter-country loss is correct only if the levels of other agricultural inputs are unaffected by the changes in the use of tradables, if inputs are homogeneous, and if transportation costs are nil. Furthermore, the inter-country misallocation we have measured may occur for reasons other than price interventions. Nonetheless, our loss estimates of 7–16% of agricultural output or the agricultural resource base are not inconsistent with Peterson's (1979) earlier estimate of about 4% of total national income. These studies support one another in suggesting that the welfare triangles associated with agricultural price interventions in the developing countries are not trivial.

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Notes

[1] Fulginiti and Perrin also conclude from their study that cheap food policies have a significant impact on the productivity of agricultural inputs that are allocated to any particular agricultural sector, with a "productivity elasticity" of about .13% productivity loss for each 1% of net taxation of agricultural prices.

[2] According to World Bank data, the aggregate agricultural gross domestic product (GDP) of these countries in 1965 and 1984 contributed 20% of national GDP. At most, GDP in agriculture could equal gross agricultural production, in which case the two Allais measures would be equivalent to 1.52% and 3.34% of GDP, while the Debreu measures would be equivalent to 1.48% and 2.88%. To the extent that agricultural GDP is less than agricultural output, the Allais measures will be smaller fractions of national income, while the Debreu fraction would be essentially unchanged.

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