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Least-cost cheap-food policies: some implications of international food aid

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Abstract

Many low-income countries pursue cheap-food policies in which consumers pay subsidized prices for bread, rice and other staples. This paper addresses the issue of why different governments select different food subsidy policies, using multiple instruments rather than a simple across-the-board subsidy to provide consumers with access to cheap food. It examines the optimal structure of cheap-food policies in the context of a partial equilibrium model in which the country may be large in trade, and is able to combine import subsidies or tariffs, and output taxes or subsidies, to transfer income to consumers through the market. The model allows for a marginal opportunity cost of government revenues greater than one dollar. In addition, in the model, food aid from overseas may be either given away to the consumer, or given to the government for subsequent sale in the domestic market. The results indicate that only by happenstance will a country choose to use a pure consumption subsidy or a pure import subsidy to transfer income to consumers. In addition, an increase in international food aid does not necessarily lead the government to reduce producer and consumer prices for a commodity. © 1999 Elsevier Science B.V. All rights reserved.

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1. Introduction

In many less-developed countries the problem of severe absolute poverty is likely to become more serious in the next 10 years (e.g. Missiaen et al., 1995). The sources of the problem are diverse – including war, drought, inappropriate agricultural

policies, lack of physical and intellectual infrastructure, and high birth rates (Shaw, 1995). An increase in the numbers of families enduring severe poverty could give rise to a substantial increase in malnutrition. Increased concern about this possibility has led to a resurgence of interest over the past few years in both domestic policies targeted towards alleviating hunger, and the potential role of food aid from developed countries. Farm interest groups in North America and Europe are also likely to regain interest in

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food-aid programs as traditional income transfer programs benefiting farmers in those regions are curtailed. This paper examines the determinants of optimal food subsidy policies and, in particular, the links between those policies, the amount and form of international food aid, and domestic food consumption.

Historically, many low-income countries have pursued cheap-food policies that subsidize prices paid by consumers for flour, bread, rice and other staples.¹ These policies have taken different forms, but they inevitably involve burdens on domestic taxpayers, domestic producers of the subsidized commodity, or both. According to the standard textbook analysis, a simple across-the-board per unit subsidy on all consumption funded by general tax revenues is the optimal (social cost-minimizing) way to subsidize consumers (e.g. Corden, 1974). In practice, pure consumption subsidies are rarely used. Food subsidies for low-income households through price discrimination have relied on targeting and food stamp programs, while rationing schemes (in particular, through cheap-food sales in ration shops) have been used to deal with limits on the availability of subsidized food.²

Policy instruments and subsidy rates have differed across countries and have changed over time within countries. Consumption subsidies are often used in conjunction with other policies. This paper explicitly addresses the issue of why different governments select different general food consumption policies and, in addition, why multiple policy instruments are often chosen in preference to a simple across-the-board subsidy to provide consumers with access to cheap food. Our approach follows the literature on

efficient income redistribution through commodity markets, in an approach introduced by Gardner (1983).³ We begin by considering a situation in which the government provides a food consumption subsidy in the absence of food aid, and then consider the effects of different types of food aid on the policy choice.

Recently, Hoffman et al. (1994) considered the implications of food aid to developing countries for the recipient country's optimal food subsidy program.⁴ However, they assumed (a) the world price is exogenous (i.e. a *small-country* case), (b) the aid recipient country's government uses only one policy instrument – an import subsidy – to transfer income to consumers, and (c) all international food-aid food is given to consumers at zero cost. This paper re-examines the optimal structure of cheap-food policies in the context of a partial equilibrium model of the market for a staple commodity in which (a) the world price may be endogenous (i.e. a *large-country* case), (b) the country is able to combine multiple instruments – import subsidies or tariffs, and output taxes or subsidies – to transfer income to consumers through the market, and (c) food aid may be provided as either gifts to consumers or gifts to the government for subsequent sale to consumers. Some important differences in results emerge from using a more general set of assumptions.

2. Import subsidies versus consumption subsidies: a graphical illustration

In standard textbook models of domestic commodity subsidies, subsidies on total consumption of an importable commodity are always preferred to import

¹The cost of cheap-food policies as a share of total public expenditures, or even as a share of gross domestic product (GDP) can be substantial (e.g. Scobie, 1988). For instance, in 1980–1981, Egyptian food subsidies were 20% of total public expenditures and seven percent of GDP (Alderman et al., 1982). In the late 1970s, Sri Lankan food subsidies amounted to about 14% of the total public expenditure and 6% of gross national product (GNP), while similar subsidies in India and Bangladesh represented respectively about 9% and between 15 and 26% of public expenditures (Ahmed, 1988). Also in the late 1970s, the direct costs of China's food subsidies were reported to amount to between 23 and 26% of government revenue (Lardy, 1983).

²Pinstrup-Andersen (1988, p. 6) has identified many of the different forms of consumption subsidies used over the past 4 decades.

³Following Peltzman (1976) and Becker (1983), the issue of efficient market-based income transfer policies has been addressed in several studies of domestic and trade policies that enhance agricultural producer incomes. Examples include Gardner (1983, 1995), Alston and Hurd (1990), Bullock (1992, 1994, 1995), Alston et al. (1993, 1995), Gisser (1993), Salhofer (1993), Moschini and Skokai (1994), Chambers (1995), and Bullock and Salhofer (1998a, b).

⁴The amount and form of international food aid may, conversely, be affected by domestic policies. Indeed, in the past some forms of international aid have been explicitly contingent on domestic policy. Throughout this paper, the form and amount of aid are treated as strictly exogenous.

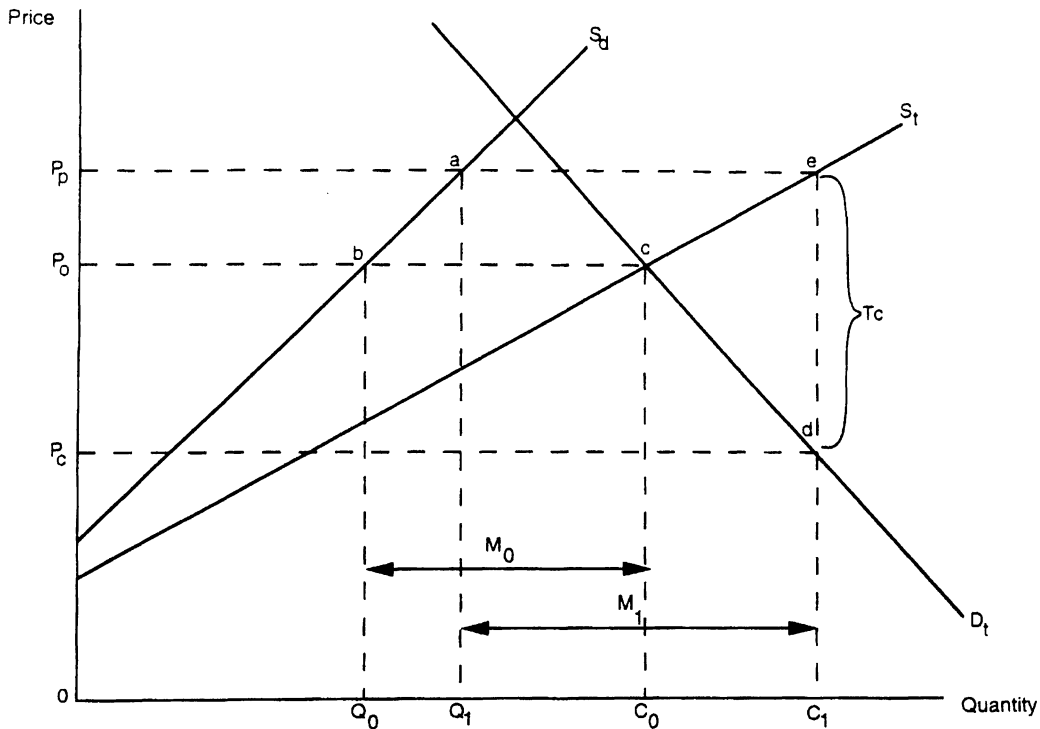


Fig. 1. Effects of a consumption subsidy in a large importing country.

subsidies because they impose lower efficiency costs on taxpayers and producers. These models, however, assume that the opportunity cost of government spending is simply the amount of tax revenue spent. As shown by Gardner (1983) and others in other settings, changing this assumption has important implications for least-cost instrument choices.

In this section, a simple diagrammatic model is presented to show conditions under which, given an all-or-nothing choice between a pure consumption subsidy and an import subsidy, the import subsidy will be preferred because of the efficiency costs associated with raising tax revenues. In addition to out-of-pocket costs incurred by taxpayers, the collection of tax revenues involves administration and enforcement costs, and costs of distortions in markets affected by tax policy. At the margin, the change in taxpayer surplus (TS) associated with changes in government spending is measured by the change in government revenue or treasury costs (TC) multiplied by a factor $(1 + \delta)$ that reflects the marginal deadweight cost of taxation (that is, $\delta \geq 0$). At the margin,

therefore, a dollar of government spending involves an opportunity cost of $(1 + \delta)$ dollars of taxpayer welfare. For developed countries such as the United States and Australia, plausible estimates of such marginal deadweight costs from distortions in taxed markets range from about 7 to 23 cents (Findlay and Jones, 1982; Fullerton, 1991). In some developing countries, the costs of taxation may be even larger because of more burdensome tax structures and higher tax collection costs.⁵ Fig. 1 presents a partial equilibrium model of the market for an importable food commodity, which includes a domestic demand function (D_t), a total supply function (S_t), and a domestic supply function (S_d) where S_t is the sum of the domestic supply function and the import supply function (S_m), which is not explicitly shown. Competitive market

⁵Here we treat δ as being fixed, exogenously. In some countries cheap-food policies may be important enough to have some effect on the social cost of general revenue measures to finance food subsidies. Chambers (1995) provides a general equilibrium treatment in which δ is endogenous.

clearing occurs at price P_0 and total consumption C_0 equals the sum of domestic production Q_0 and imports M_0 .

A per unit consumption subsidy of T_c increases consumption to C_1 by lowering the consumer price to P_c . The subsidy raises both the domestic producer price and the import price to P_p , increasing domestic production to Q_1 and imports to M_1 . Domestic producer surplus increases by area $P_pabP_0 = \Delta PS$; domestic consumer surplus increases by area $P_0cdP_c = \Delta CS$; foreign net surplus increases by area $abce = \Delta FS$; and taxpayer surplus (TS) falls by $(1 + \delta)$ times the subsidy expenditure, which is area P_pcdP_c [i.e. $\Delta TS = -(1 + \delta)(P_pcdP_c)$]. The net change in domestic welfare is $\Delta NS = \Delta CS + \Delta PS + \Delta TS = -[cde] - [abce] - \delta[P_pcdP_c]$. Thus,

the net domestic cost of a subsidy equals the sum of (a) the conventional measure of the global welfare loss (triangle cde), (b) the foreign benefit, and (c) the excess burden associated with raising revenues from taxpayers to finance transfers.

Comparing the effects of a consumption subsidy and an import subsidy that has equivalent effects on consumer welfare requires that total domestic consumption C_1 and the consumer price P_c be identical under both policies. The differences in welfare effects between consumption and import subsidies then result from differences in government outlays and the sourcing of consumption between domestic and foreign producers. These differences are illustrated in Fig. 2, where consumption-subsidy-ridden prices (P_c, P_p) and quantities (Q_1, C_1) are the same as those for the

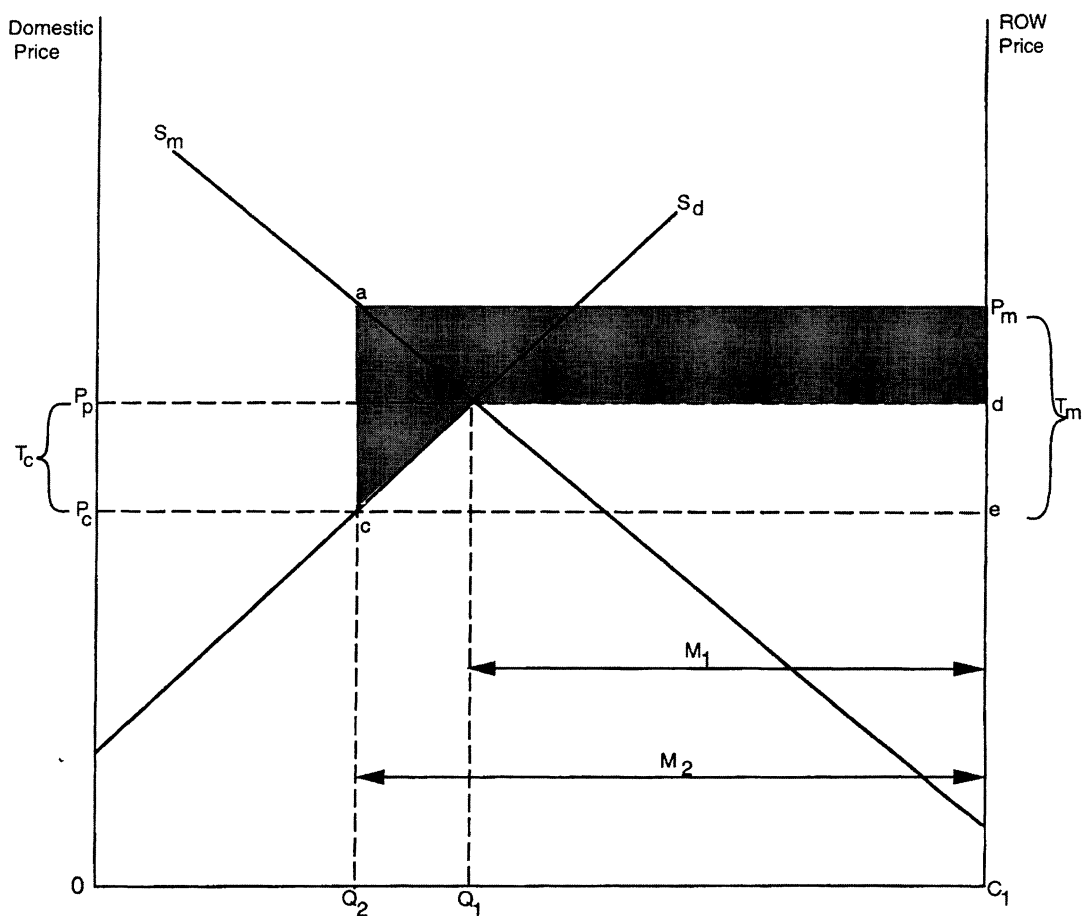


Fig. 2. "Equivalent" import subsidy and total consumption subsidy for a large country importer.

importer case in Fig. 1. In Fig. 2, S_d is the domestic supply function, and S_m is the import supply function relative to the origin at C_1 and there is no demand function because consumption is fixed at C_1 .

In Fig. 2, under an across-the-board consumption subsidy of T_c , the equilibrium is defined by the intersection of S_m and S_d at point b, domestic production is Q_1 , imports are M_1 , government expenditures are $T_c \times C_1$ (area P_pdeP_c), and the welfare effects are those shown in Fig. 1. A per unit import subsidy of T_m yields the same benefit to consumers as the consumption subsidy T_c . Under the import subsidy policy, the domestic producer price equals the domestic consumer price P_c , producer surplus falls (by area P_pbcP_c), domestic production declines to Q_2 , and imports increase to $M_2 = C_1 - Q_2$ as the import price rises to P_m . The import subsidy results in government expenditures of $T_m \times M_2$ (area $ecaP_m$). If, as in conventional analyses, there is no marginal excess tax burden ($\delta = 0$), moving from a consumption subsidy to an import subsidy reduces domestic surplus by the shaded area $dbcaP_m$ in Fig. 2, and the consumption subsidy is clearly preferred. However, if the marginal excess burden of taxation is positive ($\delta > 0$), the differences in subsidy expenditures between the two policies imply further differences in social cost that must be taken into account.

Under the consumption subsidy policy, the excess burden of taxation is $\delta T_c C_1$, under the import subsidy policy the excess burden of taxation is $\delta T_m M_2$ (or $\delta T_m [C_1 - Q_2]$), and the difference is $\delta[(T_m - T_c)C_1 - T_m Q_2]$. For a small country, this difference will always be negative (as $T_m = T_c$), and an import subsidy will involve a lower excess burden than a consumption subsidy. For a large country, as T_m must be greater than T_c , this difference may be negative or positive depending on whether government expenditures on subsidies are smaller or greater under the import subsidy. In a common scenario, with a relatively elastic import supply and only a modest fraction of consumption imported, government outlays will be much less when an import subsidy is used. In these circumstances, the all-or-nothing choice between an import subsidy and a consumption subsidy then depends on the relative sizes of the two components of deadweight costs – the additional cost of distortions in domestic production due to the import subsidy versus the cost of distortions in other markets due to greater budget

outlays under the consumption subsidy. Thus, when deadweight costs of taxation are positive, an all-or-nothing choice between an import subsidy and a pure consumption subsidy as the means of transferring income to consumers may favor the selection of an import subsidy policy.

An even more efficient policy option than either a pure consumption subsidy or a pure import subsidy may be some combination of subsidies on consumption and imports (subsidizing domestic production and imports at different rates).⁶ A more general analysis would allow for the joint determination of the amount transferred and the transfer instruments. In addition, the optimal settings of these instruments may be affected by international food aid, in ways that may depend on whether the food aid is given to the recipient country's government for subsequent resale to consumers, or given directly to the consumers themselves. We use a political-economy model to explore these issues.

3. A political economy model

In the political-economy model, the government is assumed to take account of the welfare of three interest groups in forming its food policy: food consumers, food producers, and taxpayers. Specifically, the government is assumed to maximize the weighted sum of consumer welfare, producer welfare and taxpayer welfare. In this case, however, unlike other studies that have used political preference functions to account for transfers to producers (e.g. Rausser and Freebairn, 1974; Sarris and Freebairn, 1983), consumer welfare is weighted more heavily than producer welfare.

3.1. The equations of the model

Consumer welfare and producer welfare are measured by consumer surplus (CS) and producer surplus

⁶Recently, in the explicit context of the efficient redistribution hypothesis, Bullock (1995) has shown that if several interest groups are involved, an optimal set of policies for the redistribution of income will typically involve more than one policy instrument. Bullock and Salhofer (1998a) show that transfer efficiency cannot be reduced by the addition of an instrument to the set being used.

(PS), and the change in economic surplus associated with raising taxes is defined as $\Delta TS = -(1 + \delta)\Delta TC$, where ΔTC is equal to the change in government spending or treasury cost. Hence, the objective is to maximize

$$W = \theta CS + PS - \gamma(1 + \delta)TC \quad (1)$$

In Eq. (1), producer surplus is the numeraire, with a weight of one. The weight on taxpayer surplus, γ , may be greater or less than one, but for most of what follows, for simplicity, we assume equal weights on producer and taxpayer surplus ($\gamma = 1$).⁷ The weight placed on consumer welfare, θ , is greater than 1 – and may need to be greater than $(1 + \delta)$ – to engender consumer subsidies.

Consumer surplus, CS, is defined as the area beneath the demand curve less total expenditures on food:

$$CS = \int_0^C D(u)du - P_c(C - F_1)$$

where C is consumption, P_c is the domestic consumer price, $P_c = D(C)$ is the domestic inverse demand function and F_1 is the amount of free ‘food aid’ food given away to consumers. Thus total consumer food expenditures are $P_c(C - F_1)$. Producer surplus, PS, is defined as the area beneath the producer price line and above the supply curve:

$$PS = P_p Q - \int_0^Q S(\nu) d\nu,$$

where Q is domestic output, P_p is the domestic producer price and $P_p = S(Q)$ is the domestic inverse supply curve. The treasury cost of food subsidies, TC, is

$$TC = (P_p - P_c)Q + (P_m - P_c)M - P_c F_2,$$

where M is total commercial imports (i.e. excluding food aid), P_m is the world price and F_2 is the amount of ‘food-aid’ food donated to the government for resale

to consumers. The term $(P_p - P_c)Q$ represents subsidies on the consumption of domestic output while the term $(P_m - P_c)M$ represents subsidies on imports. Only when $P_p - P_c = P_m - P_c$ does the country provide a uniform consumption subsidy. The term $P_c F_2$ represents treasury income from the sale of donated food, presuming the government is free to sell donated food at market prices.⁸

In the following analysis we define λ as the fraction of total food aid, F , that is donated to consumers at zero cost, so that $F_1 = F$, while $(1 - \lambda)$ is the fraction given to the government for resale to domestic consumers, so that $F_2 = (1 - \lambda)F$. Hence, the objective function is

$$\begin{aligned} \text{Maximize : } W = & \theta \left[\int_0^C D(u) du - P_c(C - \lambda F) \right] \\ & + P_p Q - \int_0^Q S(\nu) d\nu - (1 - \delta) [(P_p - P_c)Q \\ & + (P_m - P_c)M - P_c(1 - \lambda)F] \end{aligned}$$

Subject to:

$$C = Q + M + F$$

Given the market clearing constraint that $C = Q + M + F$, the objective function is optimized with respect to only two of the three choice variables (C , Q , and M). Optimizing with respect to C and Q implies a set of specific choices for consumer, producer and import prices. These price choices identify the domestic and trade, subsidy and tax policies for the commodity (Chambers, 1992; Alston et al., 1993).

Differentiating the objective function with respect to Q and C yields:

$$\frac{\partial W}{\partial Q} = -P_p \left[1 + \delta \left(1 + \frac{1}{e} \right) \right] + P_m(1 + \delta) \left(1 + \frac{1}{e_m} \right) = 0, \quad (2)$$

⁷Fixing $\gamma = 1$ simplifies the algebra. To evaluate the effects of $\gamma \neq 1$, loosely, using the results in the text we can reinterpret the term $1 + \delta$ as representing the combined effects of deadweight costs of taxation different from δ and a taxpayer welfare weight different from one.

⁸Here the quantity of food aid is assumed to be exogenous to government policy. This may not always be the case, as aid is often tied to political considerations. Kheralla et al. (1994), for example, have argued that aid is affected by indicators of economic performance such as the economy's growth rate. However, for the purposes at hand, in which we investigate the determinants of commodity-specific policies, the exogeneity assumption is useful.

$$\frac{\partial W}{\partial C} = P_c[(1 + \delta)[\eta - (1 - \lambda f)] + \theta(1 - \lambda f)] \left(\frac{1}{\eta} \right) - P_m(1 + \delta) \left(1 + \frac{1}{e_m} \right) = 0. \quad (3)$$

where $f = F/C$ is the fraction of total domestic food consumption satisfied by food aid, e is the own-price elasticity of domestic supply, e_m is the own-price elasticity of import supply, and η is the absolute value of the own-price elasticity of domestic demand.

3.2. Implications of the solutions

Eqs. (2) and (3) yield the following expressions for relative price ratios among P_p , P_c and P_m :

$$\frac{P_p}{P_m} = \frac{(1 + \delta)[1 + 1/e_m]}{1 + \delta[1 + 1/e]} \quad (4)$$

$$\frac{P_p}{P_c} = \frac{[(1 + \delta)(\eta - (1 - \lambda f)) + \theta(1 - \lambda f)](1/\eta)}{1 + \delta[1 + 1/e]} \quad (5)$$

$$\frac{P_m}{P_c} = \frac{[(1 + \delta)(\eta - (1 - \lambda f)) + \theta(1 - \lambda f)](1/\eta)}{(1 + \delta)[1 + 1/e_m]} \quad (6)$$

These equations reflect the nature of the policy choices, given the objective function. First, if $P_p/P_c > 1$ (< 1) consumption of the domestic product is being subsidized (taxed); second, if $P_m/P_c > 1$ (< 1), import consumption is being subsidized (taxed),⁹ third, if $P_p/P_m = 1$, the subsidies on domestic production and imports are equal; fourth, if $P_p/P_m > 1$, imports are subject to a tariff relative to domestic production (or domestic production is subsidized relative to imports), but if $P_p/P_m < 1$, domestic production is taxed relative to imports.¹⁰

The roles of the different types of food aid as influences over domestic policy choices are clear. In Eq. (4), the relative distortion in the import price (P_p/P_m) does not depend on the extent of food aid

(as measured by f) nor its nature (as measured by λ); it depends only on the marginal social opportunity cost of government spending and the elasticities of domestic and import supply. The other price ratios are affected by the quantity of food aid when it is *free* to the consumers (i.e. $F_1 > 0$, which requires $f > 0$ and $\lambda > 0$) but not when the aid is given to the government for subsequent sale to consumers (i.e. if $\lambda = 0$).

Some special cases provide useful insights about the implications of the model. First, consider the standard case in which consumer welfare, producer welfare and taxpayer costs are weighted equally in the government's objective function; that is, $\theta = 1$ and $\delta = 0$. From Eq. (4) through Eq. (6) it follows that $P_p = P_c$ and that $P_p/P_m = P_c/P_m = 1 + 1/e_m$. This is the standard result that welfare is maximized when domestic producers and consumers face the same price, and an optimal tariff of $1/e_m$ is levied on imports.

Now suppose consumer welfare is weighted more heavily than producer welfare ($\theta > 1$) but we retain the assumption that $\delta = 0$. From Eq. (4)–Eq. (6),

$$\frac{P_p}{P_m} = 1 + \frac{1}{e_m}$$

$$\frac{P_p}{P_c} = 1 + \frac{(\theta - 1)(1 - \lambda f)}{\eta}$$

and

$$\frac{P_m}{P_c} = \frac{1 + (\theta - 1)(1 - \lambda f)/\eta}{1 + 1/e_m}$$

In the small-country case ($e_m = \infty$), when $\delta = 0$, producer and import prices are equal ($P_p = P_m$) and the optimal policy is a pure consumption subsidy. If the importing country is 'large' and has monopsony power in trade ($e_m < \infty$) an optimal tariff of $1/e_m$ is levied on imports relative to domestic production. The optimal tariff rule is reflected in a distortion in the ratio of the producer price to the import price (P_p/P_m), which is independent of the degree of preference for consumer welfare represented by θ . However, $P_p > P_c$, regardless of whether the country has market power in international markets, and this means that domestic consumption is subsidized relative to domestic production so long as (a) consumers are relatively influential ($\theta > 1$) and (b) free food aid does not

⁹Notice that a pure import subsidy, as assumed by Hoffman et al. (1994), requires $P_p/P_c = 1$ as well. In Eq. (5), this requires that $\delta = 0$ and $\theta = 1$ which would rule out consumer subsidies altogether.

¹⁰The required subsidies, domestic taxes, and tariffs could be implemented explicitly by a country's excise and internal revenue services or implicitly through, say, the operations of parastatal marketing entities.

constitute all of domestic consumption ($f < 1$ and $\lambda \leq 1$). The rate of consumer subsidy relative to producers is independent of the elasticity of supply of imports: the price ratio (P_p/P_c) is the same for small and large countries alike.

Combining these two effects, domestic consumption is subsidized relative to imports ($P_c < P_m$) only if $1/e_m < (\theta - 1)(1 - \lambda f)/\eta$. As noted above, when the country is small ($e_m = \infty$) and $\theta > 1$, this condition will always be satisfied. When the country is large, however, the government's preference for consumer welfare must be sufficiently large to offset its preference for tariff revenues. Clearly, as the government's preference for consumer welfare increases (and θ increases), the import tariff declines. Nevertheless, in the large-country case the domestic production subsidy will be larger than the import subsidy (as imports are taxed relative to the domestic producer price). Hence, in summary, when $\delta = 0$ it follows that $P_p \geq P_m$, $P_p > P_c$, and $P_c \geq P_m$.

This special case (with $\delta = 0$) also provides a useful insight about the role of food aid in determining optimal domestic and trade policies. When the share of consumption provided as free food aid increases (i.e. λf increases), the subsidy provided to consumers on domestic output declines (P_p/P_c declines). There is a common-sense economic explanation for this result. As food aid in the form of free food to consumers increases, at any given level of P_c consumer surplus is increased because total consumer expenditures on the commodity decline when free food is substituted for purchased food. The government's optimal policy is then to redistribute some of the initial increase in consumer welfare resulting from the free food to other groups – i.e., foreign aid crowds out domestic aid to consumers – and, in both the small-country and large-country scenarios, taxpayers benefit when subsidies on domestic production and imports decline.

In the small-country case, producer welfare is unaffected since the producer price remains equal to the import price, which itself remains unchanged when imports are displaced by food aid, because e_m is infinite. In the large-country case, producer welfare declines. Assuming a constant import supply elasticity, it is optimal for the country to levy a constant proportional import tariff relative to domestic production (from Eq. (4), $P_p = (1 + 1/e_m)P_m$). However, the increase in free food aid displaces some imports

and, therefore, reduces both the import price and the domestic producer price.

Now consider the more general case described by Eqs. (4)–(6) where $\delta > 0$ and $\theta > 1$. Eq. (4) demonstrates that the ratio of P_p to P_m is not affected by the government's intensity of preferences for consumers, since θ does not appear in this expression. Indeed, P_p/P_m is determined uniquely by the deadweight costs of taxation, δ , and domestic and import supply elasticities, e and e_m . From Eq. (4), if $(1 + \delta)/\delta > e_m/e$ then P_p exceeds P_m and imports are subject to a tariff relative to domestic output. If the country is small ($e_m = \infty$), Eq. (4) implies that $P_p < P_m$; that is, domestic production will be taxed relative to imports. The reason is straightforward. Given equal weights on the welfare of producers and taxpayers, a dollar of treasury expenditure counts for more than a dollar of domestic producer surplus, and a (Ramsey-type) tax on domestic output is optimal. Moreover, as δ increases, the size of the tax also increases so that P_p falls relative to P_m .¹¹

The ratio of the producer price to the consumer price, P_p/P_c , depends on θ , δ , f , λ , e , and η . From Eq. (5), $P_p > P_c$ if $[\theta - (1 + \delta)](1 - \lambda f) > \delta\eta/e$. Thus, domestic output is subsidized only if the government prefers consumers to taxpayers by a sufficiently large amount; that is, θ must be greater than $1 + \delta + [\delta\eta/(1 - \lambda f)e]$. Even if consumer welfare and taxpayer costs are weighted equally ($\theta = 1 + \delta$), producers will be taxed relative to consumers, since the term $\delta\eta/(1 - \lambda f)e$ is strictly positive. Note also that, as λf (free food aid) increases, the ratio of P_p to P_c falls. Again, this result obtains because, as food aid increases, consumer surplus rises and the government's optimal response is to transfer some of the benefits of increased aid to taxpayers (through lower consumer subsidies) and, in the large-country case, to producers (through higher producer prices).

The ratio of the import price to the domestic consumer price, P_m/P_c , depends on θ , δ , η , e_m , λ and f . From Eq. (6), $P_m > P_c$ if $\eta(1 + \delta)/e_m < [\theta - (1 + \delta)](1 - \lambda f)$. Thus, imports are subsidized only if consumer welfare is weighted more heavily than treasury costs in the government's objective function ($\theta >$

¹¹From Eq. (4), $\partial(P_p/P_m)/\partial\delta = -(1/e)(1 + 1/e_m)/r^2$ where $r = 1 + \delta(1 + 1/e)$. This derivative is clearly negative as e , e_m and r^2 are positive.

$1 + \delta$). Even then, there is no guarantee that domestic consumption of imports will be subsidized, although this becomes more likely as domestic demand becomes more inelastic (η decreases) and the supply of imports becomes more elastic (e_m increases). In addition, as free food aid becomes a larger proportion of domestic consumption, the likelihood that food imports will be subsidized declines. This occurs because, as noted above, the government becomes less willing to subsidize consumption at the margin (through the use of subsidies on imports and domestic output).

An interesting question concerns the circumstances under which it is optimal for a country to implement a pure import subsidy program, so that $P_p < P_m$ (imports are subsidized) and $P_p = P_c$. The first condition, $P_p < P_m$, requires $(1 + \delta)/\delta < e_m/e$, or, equivalently $(1 + \delta)/e_m < \delta/e$. This condition is satisfied if the country is small ($e_m = \infty$) and $\delta > 0$, which is the case modeled by Hoffman et al. (1994). However, unless $\theta = 1$ and $\delta = 0$ (which would mean no consumer subsidies), the second condition, $P_p = P_c$, will be met only by happenstance; the domestic consumer and producer prices are equal only if $[\theta - (1 + \delta)](1 - \lambda f) = (1 + \delta)\eta/e$. Thus, even in the small-country case, it is unlikely that the optimal policy will be a pure import subsidy. If, as noted above, θ is sufficiently large and $\delta > 0$, a small country will subsidize domestic consumption relative to both imports and domestic production, but at different rates. It is quite possible, however, that domestic production will be taxed relative to domestic consumption.

3.3. Effects of food aid

The effect of food aid on incentives for the recipient country's agricultural sector has been a controversial issue. The above results indicate that when food aid is donated to the recipient country's government, which is free to sell the food to domestic consumers (i.e. when $\lambda = 0$ all the food aid is of this form), it has no effect on the policy-determined relative prices. Hence, in the small-country case, the welfare effects of food aid fall entirely on taxpayers. An increase in food aid will not always cause producer prices to fall. In the large-country case, however, the aid-induced reduction in commercial imports implies reductions in all of

the prices, while preserving the ratios, leading to some benefits to consumers and some reduction in producer welfare.

When food aid takes the form of free food to consumers (for instance, when $\lambda = 1$ all the food aid is of this form) it still does not affect the relative prices paid for domestic production or imports (Eq. (4)). In other words, the relationship between the domestic producer price, P_p , and the world price, P_m , is independent of the way in which food aid is provided. The degree to which imports are subject to a tariff or subsidy relative to domestic production depends only on the supply elasticities and the dead-weight cost of taxes and these are invariant to the mechanism for providing food aid. This is not generally the case with respect to consumer subsidies either in relation to imports or domestic production. It can be seen in Eqs. (5) and (6) that the sign of the effect of an increase in free food aid (an increase in λf) depends on the relative sizes of the weight on consumer welfare, θ , and the weight that translates government spending into taxpayer welfare, $(1 + \delta)$. An increase in free food aid could arise from either an increase in total food aid, f , for a given proportion, λ , being free to consumers, or an increase in λ for a given f . Either way, if $\theta > (1 + \delta)$, as required for a consumer subsidy from taxpayers, then an increase in free food aid will cause a decrease in both P_p/P_c and P_m/P_c .

We can compare the effects of food aid given to consumers and food aid given to the government for sale to consumers by evaluating the effects of λ in Eqs. (5) and (6) – the effect of a reduction in λ shows the effect of giving aid to the government rather than consumers. If the government places a greater weight on consumer welfare than tax revenues ($\theta > 1 + \delta$), a reduction in λ implies an increase in both of the price ratios, P_m/P_c and P_p/P_c . Hence, consumption of both imports and domestic production are more heavily subsidized (or less taxed) when taxpayers, rather than consumers, receive the initial benefits from food aid. This makes sense. As we noted above, when consumers receive more free food the government may reallocate some of the increase in the country's net wealth towards taxpayers and producers. When the initial incidence of the wealth increase is on taxpayers, the government may reallocate some of the wealth increase to consumers through larger subsidies (or lower taxes) on domestic production and imports.

The above results indicate that observed consumer food subsidies will be larger when the treasury is the initial beneficiary of food aid. This does not mean that consumers are better off if the government is permitted to sell food-aid food to domestic consumers, though it does imply, at least in the small-country case, that food consumption will be larger. This result obtains in the small-country case because P_m is exogenous and the ratio of P_m to P_c is larger when the government sells food-aid food rather than being required to give it to consumers for free. Thus, P_c must be lower and domestic consumption higher when international food-aid food is sold by the government. Whether consumer welfare is higher when the government markets food-aid food is another matter. Food aid distributed freely to consumers may mean higher market prices but, quite possibly, a lower food bill as some of the food is freely available to consumers.

The size and distribution of the net welfare effects of the different forms of food aid, in the context of a country with a cheap-food policy, are only partly apparent. It seems likely that consumers will prefer food aid given to them rather than the government, while taxpayers will prefer the converse. Producers are unaffected by food aid in the small-country case, and will prefer the aid to be given to the government in the large-country case, since their losses are smaller than when the aid is given to consumers. Clearly national welfare increases with either form of aid, and the net welfare effects are likely to depend on both the form of aid and the size of the country in trade. In many instances, the recipient country's net benefits from food aid will be greater than the value (at undistorted prices) of the quantity of the commodity given as aid, since the effect of the aid will be to reduce the distortions resulting from the cheap-food policy.

4. Conclusions

Cheap-food policies are common and economically important in many less-developed countries. Conventional analysis may suggest that the least-cost cheap-food policy would be a pure consumption subsidy, financed by an efficient general tax policy. As suggested by the arguments of Moschini and Scokoi (1994), if we can separate the financing and spending decisions, ad hoc trade-distorting policies would be undesirable income transfer mechanisms: a lump-sum

tax to finance consumption subsidies would avoid distortions in trade while not involving any distortions in other markets. Indeed, if lump-sum taxes were available, they would be a relatively efficient source of funds for all types of public goods; the next-best alternative may be a uniform tax on all goods or a set of Ramsey-type taxes.

On the other hand, a realistic assessment of policies ought to recognize that lump-sum taxes are not available and that the so-called efficient taxes are not being used as general revenue measures. Thus it may be possible, in a 'third-best' world, to do better than the 'second-best' policy prescription (consumer subsidies from general revenues) which ignores the possibility that, at the margin, a tax on the commodity market of interest may be a lower-cost source of funds than general revenue measures. This possibility seems particularly to be likely in the case of less-developed countries where general revenue measures are relatively inefficient. Transfers through commodity markets arise because, in fact, lump-sum taxes are no more available than are lump-sum transfers. Thus, actual policy choices may make more economic sense than a conventional theoretical viewpoint would suggest.

Our comparative static results show how the optimal policy mix is unlikely to involve a pure consumption subsidy, especially when the country has little capacity to affect world prices for the commodity. Our exploration of the effects of foreign aid on the country's least-cost cheap-food policy also shows that the size and distribution of the benefits from food aid depend importantly on the size of the country in trade, and whether the aid is given to consumers or the government in the first instance.

In the small-country case, it is not optimal to distort producer prices relative to import prices, even when subsidizing consumers, unless there are deadweight costs of raising subsidy revenues elsewhere in the economy, regardless of whether food aid is being provided. But even in this case, the form of the aid determines how (indeed whether) the government subsidy policy should adapt to re-optimize the domestic distribution of welfare. Introducing deadweight losses from general revenue measures (i.e. $\delta > 0$) does not change the two key general results. Namely, when the country cannot affect world prices, producers do not benefit (nor lose) from international food aid regardless of the way in which it is given; and con-

sumers can only benefit when the aid is given to them directly. In the large-country case, many of the small-country results are retained once the role for optimal tariffs is recognized and understood. In reflection of the role of market power in trade in modifying the optimal domestic distortions, now producer and consumer welfare are affected by both forms of aid, but differentially.

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