Efficiency of Decoupled Farm Programs under Distortionary Taxation

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ABSTRACT

When lump-sum taxation is not feasible, decoupled transfers to farmers (which require raising government revenue) will entail welfare loss somewhere in the economy. Assuming the government's objective is to assure a given welfare level for farmers, we show that when decoupling is possible, free trade is always superior to some tariff protection for a small country, even under distortionary taxation. As expected, for a large country there is scope for an optimal tariff policy that improves the terms of trade. However, we show a separation between the exercise of market power through an optimal tariff, and the interaction of distortionary taxation with transfers to farmers. We conclude that decoupling is usually desirable, even in a distorted economy in which lump-sum taxation is not feasible.

EFFICIENCY OF DECOUPLED FARM PROGRAMS UNDER DISTORTIONARY TAXATION

Introduction

The issue of efficiency of agricultural policy tools as a means of income transfer has long been of interest to agricultural economists (Wallace). Recent studies include Gardner (1983, 1987b), de Gorter and Meilke, and Bullock. The partial equilibrium approach of these studies typically neglects a fundamental issue associated with agricultural policies. Namely, because most agricultural programs are financed by direct government expenditure (an exception may be a production quota), they require governments to raise the necessary funds through taxation. If lump-sum taxes are not feasible, raising tax revenue to implement farm programs entails additional distortions (welfare costs), over and above those created by intervention in the agricultural market.

This problem has been noted before. Gardner (1983), discussing the efficiency ranking of production quotas and deficiency payments in a closed economy, warns that the slope of his Surplus Transformation Curves (the marginal change in producer surplus for each dollar lost by consumers/taxpayers) can be affected by losses from taxation, making production control the preferred alternative under a wider range of market conditions. Alston and Hurd consider the effects of distortionary taxation on the efficiency ranking of some single- and multiple-instrument programs, both for a closed economy and for a small open economy. Their results underscore the importance of accounting for these indirect welfare costs and offer two unexpected conclusions: first, when the indirect welfare costs of agricultural policies are considered, tariff protection may be superior to free trade; second, "decoupled" policy tools are not necessarily desirable.

In this paper, we extend this line of research and explicitly focus on the efficiency of decoupled transfers to agricultural producers. This is a timely issue given the recent policy debate concerning the reform of domestic agricultural policies, especially as they relate to the current GATT (General Agreement on Tariffs and Trade) negotiations. In this context, the concept of "decoupling" (that is, devising ways to provide support to farmers that do not distort production, consumption and trade) is enjoying increasing popularity among economists and policymakers.[1] One of the most interesting attempts at decoupling agricultural policies is offered by recent reforms of the Common Agricultural Policy (CAP) of the European Community (EC), which entail lower guaranteed prices for some major crops (cereals, oilseeds, protein crops) and a new per-hectare payment provided to participating farmers. Clearly, a monetary transfer linked to a fixed factor like land is a practical way of implementing the idea of decoupling farm programs. Moreover, because these subsidies will be directly financed by EC taxpayers, evaluating the efficiency of decoupled transfers in the presence of distortionary taxation becomes extremely important.[2]

This paper extends previous studies in two ways. First, it is analytically grounded in the optimal taxation literature, thus tackling head-on the interesting issue of indirect deadweight losses associated with transfers. Second, it deals explicitly with the large country case (which appears relevant to analyze policy changes in the European Community or the United States). Our analytical approach follows Gardner's (1987a) definition of efficiency of farm programs:

> "In the context of a commodity market, redistribution to producers can be measured as gains in economic rents at the expense of taxpayers' income and consumers' surplus. The cost of redistribution to producers is the deadweight loss associated with such transfer. Efficient redistribution minimizes deadweight losses for a given transfer."

Specifically, we consider a partial equilibrium framework in which the government's objective function is to minimize deadweight losses from its intervention in commodity markets, subject to the constraint of meeting a target welfare level for agricultural producers. As in analogous studies, consumers and taxpayers are considered a single group, thus ignoring the issue that different types of intervention imply significant redistribution effects among different income groups.

To account for deadweight losses of taxation in our partial equilibrium framework, we follow Alston and Hurd and assume an exogenous and constant marginal excess burden of taxation, labeled δ.[3] This approximation is reasonably accurate as long as agricultural transfers are small compared with the total amount of tax collection, as is the case in developed countries such as the European Community or the United States.[4] The main analysis deals with the large open economy case, but insights are gained by first considering the closed economy problem. The special case of a small open economy is also illustrated, and the extension of our partial equilibrium results to general equilibrium is briefly discussed with our conclusions.

The Closed Economy

Given that the government wishes to transfer income from consumers/taxpayers to farm producers, the most efficient way of achieving this goal would be a decoupled transfer to farmers financed by lump-sum taxes. When lump-sum taxes are not feasible, however, even a decoupled transfer will create deadweight losses elsewhere in the economy because it requires additional tax revenue that can only be raised in a distortionary fashion. In such a case, optimal taxation considerations suggest that all markets ought to be taxed appropriately, including the agricultural market whose producers are the target of the income transfer. Hence, in modeling optimal government decisions, it is important to allow for the possibility of a commodity tax on the agricultural market.

Specifically, consider the government problem of choosing the optimal decoupled transfer R and the optimal supply price P_s to minimize welfare losses, subject to the constraint that total rent to producers must be at least as large as a given income target I. The total rent to producers is equal to the sum of decoupled transfer R plus the producer surplus $\Pi(P_s)$ defined as

$$\Pi(P_s) = \int_0^{P_s} S(P)\,dP \tag{1}$$

where S(P) is the supply function and P_s is the producer price. Note that by choosing P_s the government also chooses the demand price P_d, because the latter solves the closed economy market equilibrium condition $S(P_s) = D(P_d)$. Thus, choosing a supply price in this setting is equivalent to choosing an optimal commodity tax rate.

The welfare costs are given by the deadweight losses from tax collection in this market (the shaded area in Figure 1), plus the deadweight losses elsewhere in the economy necessary to finance the income transfer (the difference between the transfer R to producers and the tax revenue in this market). Hence, total deadweight losses can be represented as

$$L(P_s, R) \equiv \int_{P_s}^{P_c} S(P)\,dP + \int_{P_c}^{P_d} D(P)\,dP - (P_d - P_s)\,S(P_s) + \delta\left[R - (P_d - P_s)\,S(P_s)\right] \tag{2}$$

where D(P) is the demand function, P_c is the competitive equilibrium price (in the absence of commodity taxes), and δ is the (constant) marginal welfare loss of taxation.

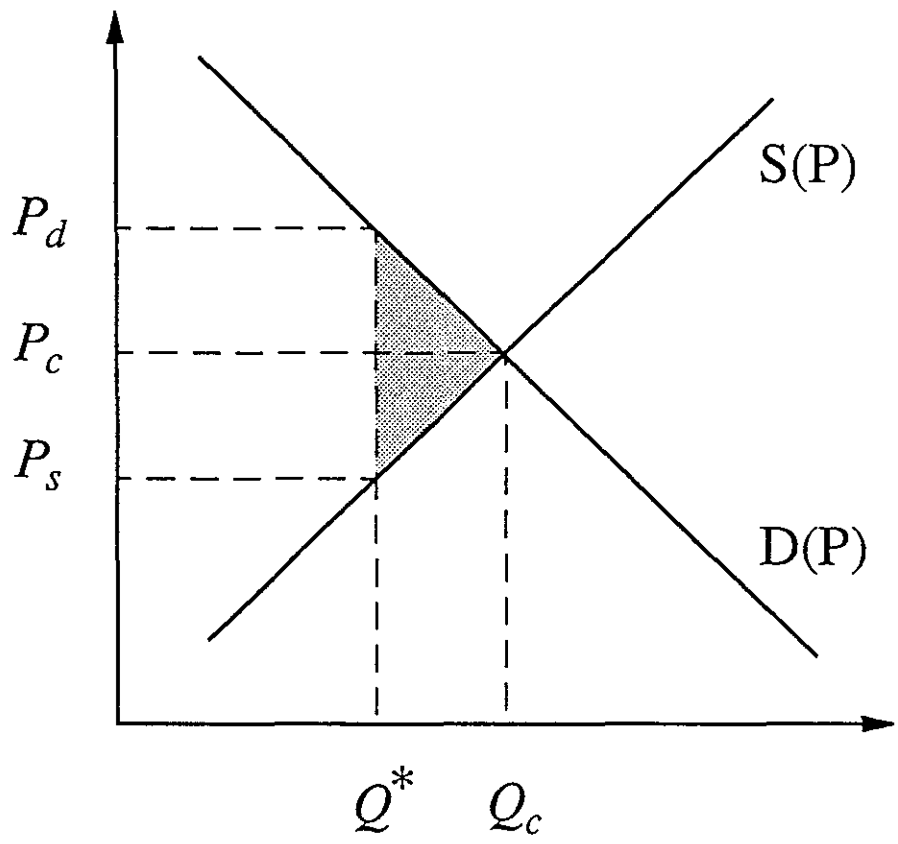
As long as δ is constant, it is not necessary to be specific about the source of tax distortions in the economy. Given our partial equilibrium setting, it is natural to think of commodity taxation in other markets as the source of tax revenue (and the reason for $\delta > 0$), which gives an obvious justification for a commodity tax in the agricultural market as well. Other types of distortionary taxation (i.e., income taxation), however, could clearly be responsible for $\delta > 0$.

To be consistent with our hypothesis that lump-sum taxation is not possible (otherwise δ would equal zero), it is necessary to constrain the decoupled transfer R to be nonnegative. Hence, we have the following nonlinear programming problem for the government:

$$\min_{P_s,\, R \geq 0} \quad L(P_s, R) \quad s.t. \quad \Pi(P_s) + R \geq I \tag{3}$$

Note that the loss function $L(P_s,R)$ is typically convex, but so is the constraining function.[5] Forming the Lagrangian, the problem is

Figure 1. The Closed Economy Case



$$\min_{P_s, R, \lambda \geq 0} \left\{ L(P_s, R) + \lambda \left[I - \Pi(P_s) - R \right] \right\} \tag{4}$$

where λ is the Lagrange multiplier (the shadow cost) of the producer income target constraint.

The Kuhn-Tucker conditions for this problem are

$$\frac{\partial L(P_s, R)}{\partial P_s} - \lambda \, \Pi'(P_s) \geq 0 \qquad \left[\frac{\partial L}{\partial P_s} - \lambda \Pi' \right] P_s = 0 \tag{5}$$

$$\delta - \lambda \geq 0 \qquad (\delta - \lambda) R = 0 \tag{6}$$

$$I - \Pi(P_s) - R \leq 0 \qquad (I - \Pi - R)\lambda = 0 \tag{7}$$

where $\delta = \partial L/\partial R > 0$ is given and constant. Clearly, the solution to this problem depends crucially on the level of the income target I. To illustrate, let $I^0 \equiv \Pi(P_s^0)$ where P_s^0 is the optimal solution of the unconstrained problem. Then, for $I \leq I^0$, $\lambda = 0$, $R = 0$, and P_s solves $\partial L/\partial P_s = 0$, that is

$$- S(P_s) + D(P_d) \frac{dP_d}{dP_s} - (1 + \delta) \left[\left[\frac{dP_d}{dP_s} - 1 \right] S(P_s) + (P_d - P_s) \, S'(P_s) \right] = 0 \tag{8}$$

Recalling that $D(P_d) = S(P_s)$ for market clearing, which also implies $dP_d/dP_s = S'(P_s)/D'(P_d)$, the resulting optimal tax rate can be expressed in elasticity form as

$$\frac{P_d - P_s}{P_d} = \frac{\kappa}{-\epsilon_d} \left[\frac{\epsilon_s - \epsilon_d}{\epsilon_s + \kappa} \right] \tag{9}$$

where $\kappa \equiv \delta/(1+\delta) > 0$ is a more convenient measure of marginal tax distortions, $\epsilon_d < 0$ is demand elasticity, and $\epsilon_s > 0$ is supply elasticity. This is the standard partial equilibrium optimal taxation result for a closed economy.[6]

For $I > I^0$, then $\lambda > 0$. But, as long as $0 < \lambda < \delta$, $R = 0$. Thus, P_s solves $I = \Pi(P_s)$ and λ solves $\partial L/\partial P_s - \lambda \, \Pi'(P_s) = 0$. For increasing I, λ increases until (at I^1, say) $\lambda = \delta$. For income targets above I^1, $R > 0$. In particular, P_s solves $\partial L/\partial P_s - \delta\,\Pi'(P_s) = 0$, such that $\partial P_s/\partial I = 0$, whereas R solves $\Pi(P_s) + R = I$, such that $\partial R/\partial I = 1$. Because $\lambda = (\partial L/\partial P_s)/\Pi'(P_s) > \delta$ when evaluated at $P_s = P_d$, then $I^1 < \Pi(P_c)$ (in other words, the optimal supply price cannot exceed the no-tax equilibrium price). Subtracting $\delta\,\Pi'(P_s) = \delta\,S(P_s)$ from the left-hand side of equation (8) yields the optimal demand price for the case $R > 0$ which, in elasticity form, is

$$\frac{P_d - P_s}{P_d} = \frac{\kappa}{-\epsilon_d} \qquad (10)$$

a formulation equivalent to the standard "inverse elasticity rule" of partial equilibrium models of optimal commodity taxation under constant returns to scale (Atkinson and Stiglitz, Baumol and Bradford). The reason why supply elasticity does not matter in equation (10), unlike equation (9) and notwithstanding the upward sloping supply curve, is that the redistributional objective of the government at the margin is achieved by decoupled transfers. With $R > 0$ and $\lambda = \delta$, the marginal deadweight loss of commodity taxation depends only on the responsiveness of demand.

In short, there is a range of income targets, between I^0 and I^1, where income support to farmers is more efficiently achieved through price instruments, by reducing taxation. After a certain threshold, however, income support to farmers is best achieved by decoupled transfers. The economic intuition for this result is immediate. Essentially, there are two techniques for achieving the income target: supporting price through reduced taxation is a technique with increasing marginal costs, whereas decoupled transfers is a technique with constant marginal costs (because δ is assumed constant). For low-income targets the first technique is more efficient, whereas for high-income targets the second technique dominates. Under the latter case, a decoupled transfer to farmers is still the optimal policy for the closed economy, despite the existence of distortionary taxation.

As long as there is a deadweight loss to raising tax revenue, our results indicate that there is a positive tax rate on the agricultural market. Moreover, this result holds regardless of whether or not this market is being targeted for income subsidy to producers, although the level of the required tax may be different, as a comparison of (9) and (10) indicates. Thus, when one accounts for the deadweight costs of tax collection, the second-best equilibrium of the agricultural commodity market entails an optimal quantity lower than that of the competitive equilibrium.

It is important to note, however, that the reduction in the equilibrium quantity is due to the implementation of an optimal commodity tax and not to the decision to raise additional revenue to subsidize farmers. Indeed, from the foregoing analysis it is easy to see that $\partial S/\partial I > 0$ when $R = 0$ and $\partial S/\partial I = 0$ when $R > 0$. Given that the after-tax equilibrium is the relevant one under distortionary taxation, the desire to transfer income to farmers, if anything, will increase optimal supply (but recall that optimal supply will never exceed the no-tax competitive equilibrium Q_c). As long as commodity taxation is feasible, there is no need to enforce the optimal supply level with a production quota. However, if one interprets Q^* in Figure 1 as the after-tax equilibrium quantity, what Alston and Hurd consider as optimal policy for a closed economy (a per-unit subsidy combined with a production quota set at Q^*) may be equivalent to our optimal policy if two additional qualifications hold: Q^* is the after-tax equilibrium when $\lambda = \delta$, and the optimal decoupled transfer $R > 0$ is larger than the quota rent $(P_d - P_s)Q^*$.

The Large Open Economy

The analysis of the efficiency of decoupled programs cannot neglect the large open economy case, arguably the one most relevant to policy reform in developed countries. Here we explicitly model a large importer, but clearly the case of a large exporter yields similar results. We assume that the government can choose among three instruments: a per-unit tariff, a per-unit consumer tax, and a decoupled transfer. Choosing a consumer tax is modeled in terms of choosing a demand price P_d. Given that, choosing a tariff becomes equivalent to choosing the supply price P_s. The simultaneous presence of a tariff and of a commodity tax will create a wedge between demand price and world price equal to the sum of the two instruments, as illustrated in Figure 2. Note that there is more than one set of instruments that would achieve this partial equilibrium outcome. For example, a tariff that raises import price to P_d, and a production tax that lowers supply price to P_s, would have identical effects.

The government's objective is to minimize total deadweight loss, subject to the income target constraint for producers. Because tariff revenue can substitute for tax revenue for the purpose of financing decoupled transfers to producers, the total deadweight loss is equal to area (d+f) less area g in Figure 2, plus the distortions associated with the required additional tax collection elsewhere in the economy [the transfer R minus the sum of tariff (area e+g) and tax (area a+b)]. Analytically:

$$L(P_d,P_s,R) \equiv S(P_s)(P_s - P_c) - \int_{P_c}^{P_s} S(P)dP + \int_{P_c}^{P_d} D(P)dP - (P_d - P_c)D(P_d) \tag{11}$$
$$- (P_c - P_w)\left[D(P_d) - S(P_s)\right] + \delta\left\{R - (P_s - P_w)\left[D(P_d) - S(P_s)\right] - (P_d - P_s)D(P_d)\right\}$$

where P_c is the world price without intervention, P_w is the market-clearing world price, and δ, S(P), and D(P) are as defined earlier. It is important to emphasize that the world price P_w is not exogenous, but is a function of the choice variables P_s and P_d. Hence, P_w solves the equilibrium condition

$$D(P_d) - S(P_s) = X(P_w) \tag{12}$$

where $X(P_w)$ is the world excess supply.

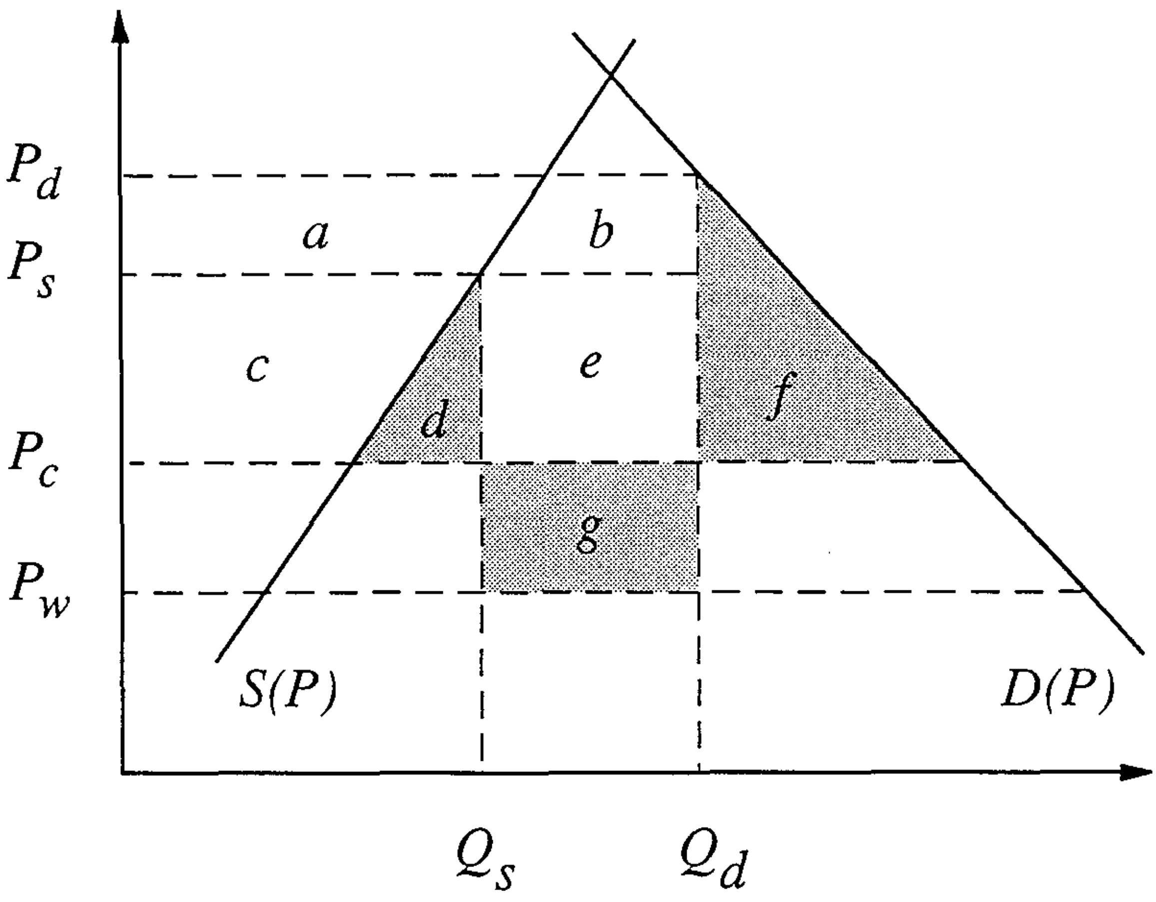
In this setting, the government problem is

$$\underset{P_d, P_s, R, \lambda \geq 0}{Min} \left\{ L(P_d, P_s, R) + \lambda\left[I - \Pi(P_s) - R \right]\right\} \tag{13}$$

The Kuhn-Tucker conditions are

$$\frac{\partial L(P_d, P_s, R)}{\partial P_d} \geq 0 \qquad \left[\frac{\partial L}{\partial P_d}\right] P_d = 0 \tag{14}$$

Figure 2. The Large Importer Case



$$\frac{\partial L(P_d,P_s,R)}{\partial P_s} - \lambda\,\Pi'(P_s) \geq 0 \qquad \left[\frac{\partial L}{\partial P_s} - \lambda\,\Pi'\right] P_s = 0 \tag{15}$$

$$\delta - \lambda \geq 0 \qquad (\delta - \lambda)\,R = 0 \tag{16}$$

$$I - \Pi(P_s) - R \leq 0 \qquad (I - \Pi - R)\,\lambda = 0 \tag{17}$$

where $\delta = \partial L/\partial R > 0$. Again, the solution to this problem depends on the level of the income target. Let P_d^0 and P_s^0 denote the unconstrained solutions, and define $I^0 \equiv \Pi(P_s^0)$. Then, for $I \leq I^0$ we have $\lambda = 0$ and $R = 0$, and P_d and P_s solve $\partial L/\partial P_d = 0$ and $\partial L/\partial P_s = 0$. Differentiating the loss function with respect to P_d and P_s, one finds:

$$(1+\delta)\left\{-(P_d - P_w)\,D'(P_d) + \frac{\partial P_w}{\partial P_d}\left[D(P_d) - S(P_s)\right]\right\} - \delta\,D(P_d) = 0 \tag{18}$$

$$(1+\delta)\left\{(P_s - P_w)\,S'(P_s) + \frac{\partial P_w}{\partial P_s}\left[D(P_d) - S(P_s)\right]\right\} + \delta\,S(P_s) = 0 \tag{19}$$

Because the world price P_w solves the equilibrium condition (11), by implicit differentiation it follows that

$$\frac{\partial P_w}{\partial P_s} = -\frac{S'(P_s)}{X'(P_w)} \tag{20}$$

$$\frac{\partial P_w}{\partial P_d} = \frac{D'(P_d)}{X'(P_w)} \tag{21}$$

Combining equations (18)-(21) we derive the optimal wedge between domestic demand and supply price (the optimal tax), and between world price and domestic supply price (the optimal tariff), which can be expressed in relative terms as

$$\frac{P_d - P_s}{P_d} = \frac{\kappa}{-\epsilon_d}\left[\frac{\epsilon_s - \epsilon_d}{\epsilon_s + \kappa}\right] \tag{22}$$

$$\frac{P_s - P_w}{P_w} = \frac{1}{\epsilon_s + \kappa}\left[\frac{\epsilon_s}{\eta} - \kappa\right] \tag{23}$$

where $\eta > 0$ is the elasticity of foreign excess supply. Note that the optimal tax rate of equation (22) is structurally the same as that of the closed economy case, whereas the optimal tariff, as expected, is inversely proportional to the elasticity of foreign export supply. It is interesting to note, from (23), that the optimal tariff is not necessarily positive under distortionary taxation ($\kappa > 0$), a point that will become clearer in the small economy case.

When $I > I^0$ then $\lambda > 0$, but as long as $0 < \lambda < \delta$ one finds $R = 0$. Thus, P_s solves $I = \Pi(P_s)$, whereas P_d solves $\partial L/\partial P_d = 0$, given P_s. The relevant question here concerns how the choice variables P_s and P_d change when the income target increases. Clearly, $\partial P_s/\partial I > 0$ if supply is upward sloping. P_d solves $\partial L/\partial P_d = 0$, given P_s. Hence:

$$\frac{\partial P_d}{\partial I} = -\frac{\partial^2 L}{\partial P_d \partial P_s}\frac{\partial P_s}{\partial I}\left[\frac{\partial^2 L}{\partial P_d^2}\right]^{-1} \tag{24}$$

Because $L(P_d,P_s,R)$ is convex, $\partial^2 L/\partial P_d^2 > 0$. Given that $\partial P_s/\partial I > 0$, the sign of $\partial P_d/\partial I$ hinges on the sign of $\partial^2 L/\partial P_d \partial P_s$. From (18), with some simplification

$$\frac{\partial^2 L}{\partial P_d \partial P_s} = - \frac{D'(P_d)\, S'(P_s)}{X'(P_w)} \left[2 - \frac{X(P_w)\, X''(P_w)}{\left(X'(P_w)\right)^2} \right] \tag{25}$$

Thus, $X''(P_w) \leq 0$ is sufficient for $\partial^2 L/\partial P_d \partial P_s > 0$, although this result may hold with $X''(P_w) > 0$ as long as $X(P_w)$ is not too convex. Thus, it seems likely that $\partial P_d/\partial I < 0$. Obviously, $\partial \lambda/\partial I > 0$, and for some income target level (I^1, say) $\lambda = \delta$. Thus, for $I > I^1$, $R > 0$. In particular, P_d and P_s solve $\partial L/\partial P_d = 0$ and $\partial L/\partial P_s - \delta\, \Pi'(P_s) = 0$, such that $\partial P_d/\partial I = 0$ and $\partial P_s/\partial I = 0$, whereas R solves $\Pi(P_s) + R = I$, such that $\partial R/\partial I = 1$. Equations (18) and (19), after subtracting $\delta\, S(P_s) = \delta\, \Pi'(P_s)$ from the left-hand-side of (19), can be solved to obtain the optimal commodity tax rate and tariff rate:

$$\frac{P_d - P_s}{P_s} = \frac{\kappa}{-\epsilon_d} \tag{26}$$

$$\frac{P_s - P_w}{P_w} = \frac{1}{\eta} \tag{27}$$

We conclude that, as expected, for a large importer there is scope for an optimal import tariff policy. However, whereas the optimal tariff can be implemented to improve domestic terms of trade, its justification does not depend on the fact that taxation is distortionary or that revenue is necessary to implement decoupled transfers. Hence, the desirability of a price wedge between domestic producer prices and foreign prices is in no way due to the redistributional goal in the presence of distortionary taxation. What the presence of distortionary taxation does entail, however, is a commodity tax also in the agricultural market.[7]

Because the price wedge created by the optimal commodity tax adds to the price wedge due to the optimal tariff, care is required not to confuse this combined effect as an indication of the desirability of tariff protection under distortionary taxation. Essentially, there is a separation between optimal taxation decisions and optimal tariff choices, which is especially clear when $R > 0$. Redistributional efficiency in the presence of distortionary taxation is better achieved by implementing a commodity tax in the agricultural market, whereas a tariff is useful only to improve the terms of trade. Under these conditions, decoupled transfers remain the most efficient way of transferring income to producers, even for large importers.

The Small Open Economy

The results derived in the previous section are sharpened when applied to the small open economy case. For a small importing country the problem is formally the same as for the large country case, and so are the Kuhn-Tucker conditions, but in this case P_w is exogenously given such that $\partial P_w/\partial P_d = \partial P_w/\partial P_s = 0$. For the unconstrained case, letting $\eta \rightarrow \infty$ equation (23) reduces to

$$\frac{P_s - P_w}{P_w} = -\frac{\kappa}{\epsilon_s + \kappa} \tag{28}$$

This apparent "negative tariff" is best interpreted as a production tax. Given this optimal production tax, the consumption tax is best expressed in terms of the world price P_w as

$$\frac{P_d - P_w}{P_d} = \frac{\kappa}{-\epsilon_d} \tag{29}$$

Thus, unlike the large country case, here there is no scope for an optimal tariff to improve the terms of trade. As for the previous cases, the optimal commodity tax policy taxes both production and consumption, which requires two instruments (P_s and P_d) given that trade is possible.

Again, an increasing income target for farmers is first met with decreasing production taxes (that is, rising P_s) and $R = 0$. P_d solves $\partial L/\partial P_d = 0$, and because $\partial L^2/\partial P_d \partial P_s = 0$ in this case, $\partial P_d/\partial I = 0$. At some critical income target level, say I^1, $\lambda = \delta$. Then, for $I > I^1$, $\partial R/\partial I = 1$ and $\partial P_d/\partial I =$

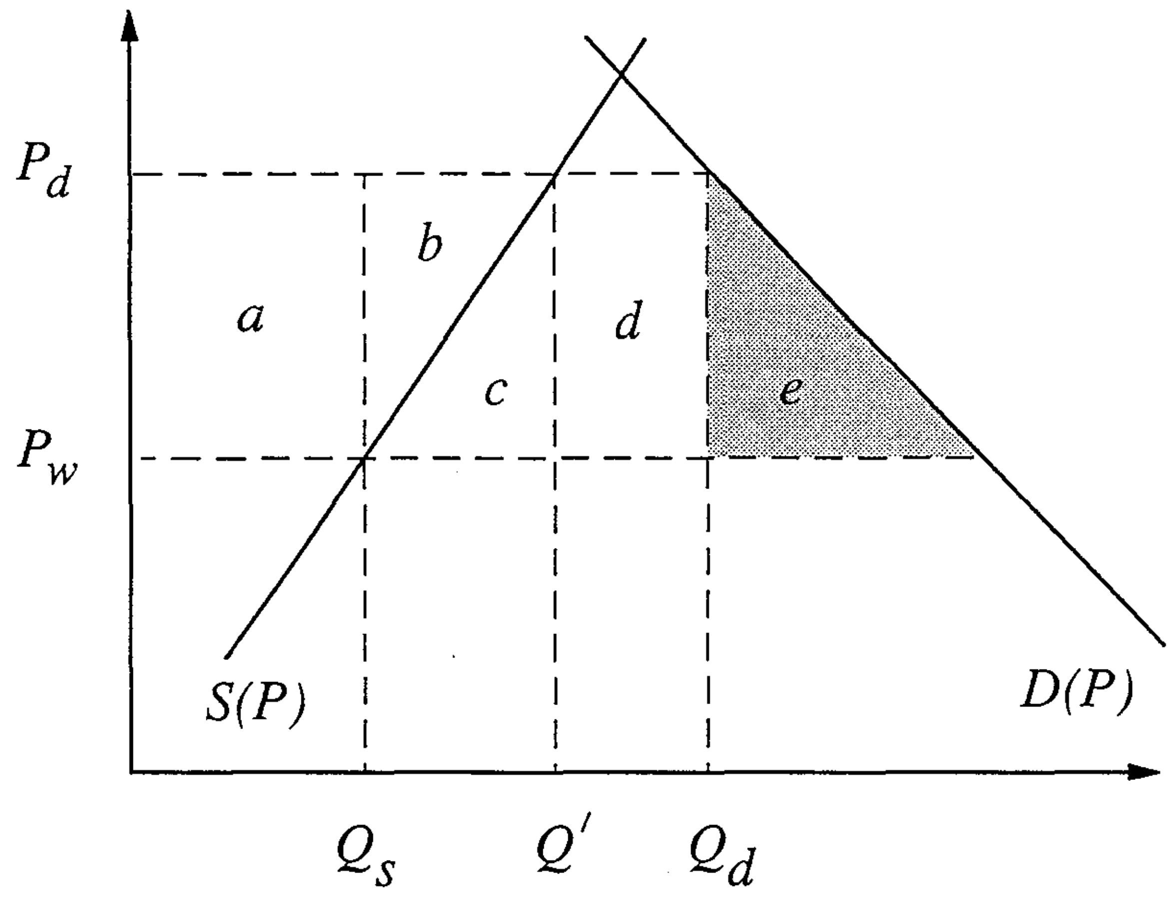
$\partial P_s/\partial I = 0$. In particular, $P_s = P_w$ and no production tax is used. Because P_d does not change with the income target I, the optimal commodity tax rate is still as in (29).

It is interesting to note that, for a small importing country, tariffs (in the sense of $P_s > P_w$) are *never* used. Hence, without market power that can be used to affect the terms of trade, supply decisions should be made efficiently at the world price, and no tariff is necessary to achieve the government income redistribution objective. This emphasizes the interpretation of the large open economy case stressed in the previous section. Moreover, because the magnitude of the optimal domestic tax depends only on distortions in tax collection, represented by κ, and does not depend on the size of the transfer R, we conclude that a decoupled transfer remains the preferred second-best policy for a small open economy, even in the presence of distortionary taxation.[8]

Our small open economy case allows a reinterpretation of the graphical results derived by Alston and Hurd. Clearly, the proposition that a tariff is always superior to free trade under distortionary taxation cannot hold for the small open economy case. Optimality requires a price wedge between world price and demand price, but no positive difference between supply price and world price. Thus, the required price wedge must be achieved by using a commodity tax and not an import tariff.

A related issue, raised by one reviewer, is that commodity taxes for the agricultural market may be deemed politically unfeasible if, at the same time, this market is being targeted for subsidy to producers. In such a case, a combination of production quota and import tariff may be used to duplicate the effects of a consumption tax.[9] This point is best illustrated for the case of a small importing country as in Figure 3. Given $R > 0$, the efficient policy calls for production to take place at the world price P_w, and for a commodity tax that raises consumer price to P_d, with a deadweight loss in this market equal to area e. If a commodity tax is not feasible, price P_d may be reached by an import tariff. The problem

Figure 3. The Small Importer Case



with that, of course, is that it would tend to increase supply to Q′. However, the efficient production level Q_S could be enforced by production quotas. The difference between this situation and the optimal commodity tax case is that tariff revenue is given by area (b+c+d), whereas the commodity tax revenue would equal area (a+b+c+d). The difference, area a, is reaped by producers in terms of increased producer surplus in the tariff with quota case. As long as the income target for farmers is not exceeded, the two cases are equivalent. The crucial point to note, however, is that import tariff and production quotas need to be used only in the amount necessary to duplicate the effects of the optimal commodity tax and cannot replace decoupled transfers. If the optimal income transfer to farmers is larger than area a, then the additional income transfer to farmers is optimally achieved by decoupled subsidies.

Conclusions

The results derived in this paper are subject to some limitations. Most obviously, they hold only if the marginal deadweight loss of taxation is constant. The assumption of a constant δ is defensible if agricultural income support requires only a small fraction of total tax revenue. If the marginal cost of tax revenue were affected by agricultural decoupled transfers, then in general both lump-sum transfer and price policies (through commodity taxes/subsidies) would be required to solve the government deadweight loss minimization problem. A more satisfactory way of addressing such a case, however, may entail relaxing the partial equilibrium framework of this paper. The essence of our results, however, is likely to be preserved. For example, Dixit and Norman's (chapter 6) general equilibrium analysis shows that government redistributional goals are better achieved by implementing a full system of optimal taxes and subsidies on commodities and factors of production, whereas, as in our case, tariffs are useful only to improve the terms of trade.[10]

We have shown that the presence of a distortionary taxation system does affect the equilibrium in agricultural markets, because optimality conditions for government intervention also require a distortionary tax (i.e., a commodity tax) in these markets as a response to the existence of distortions elsewhere in the economy. Thus, analyses of farm programs that want to account for taxation distortions should consider such a distorted equilibrium as the relevant benchmark. Once taxation distortions are thus taken into account, decoupled transfers remain superior to trade distorting tools as a mean of farm income support.

These results suggest the need to reconsider one of the conclusions of Alston and Hurd, that the benefits from decoupling may become illusory after we account for the existence of a distortionary taxation system. In particular, the shift in equilibrium quantity that they correctly derive for both the closed economy and the small open economy case does not warrant advocating trade distorting tools, because it reflects the need to tax the agricultural market given that taxation is distorting elsewhere in the economy. If a commodity tax in the agricultural market were not feasible for political reasons, then a combination of tariff and production quotas could be used to duplicate the effects of the optimal tax. However, it must be understood that such tools should be used only to substitute for the required consumption tax and not to replace decoupled transfers as the optimal tool of farm income support.

Decoupling agricultural policies may have shortcomings, especially if the administrative costs of implementation are considered. However, the fact that lump-sum transfers may cause additional costs elsewhere in the economy, because lump-sum taxes are not feasible, does not detract from the desirability of decoupled agricultural policies. Under the assumptions of this paper, decoupled transfers are likely to remain the most efficient way of redistributing income from consumers and taxpayers to farmers, and the use of tariffs is justified only for a large country wishing to exercise market power. Thus, our results support current efforts to implement decoupled agricultural policies, as attempted in the recent reform of EC's Common Agricultural Policy. Although the budget cost of farm programs may increase if decoupled transfers replace traditional policy tools, our analysis shows that the social welfare cost (deadweight loss) is reduced.

ENDNOTES

1. For a detailed review of the potential effects of decoupling agricultural policies in North America and in the European Community, see Marsh and Carr et al.

2. It is important to note that the per-hectare aid being implemented in the EC cannot be considered fully decoupled. Although current yields do not play any role in its determination, the aid remains tied to the obligation of producing certain crops (cereals, oilseeds, protein crops), it requires set-aside of some land, and it is still based on current acreage declaration (Commission of the European Community, and EEC). Nonetheless, the recent Blair House compromise, signed by U.S. and EC representatives in November 1992, considers EC's per-hectare aid a form of decoupled transfer that can be included in the so-called "green box."

3. The empirical estimate of the marginal welfare cost of taxation is still an open problem in the public finance literature. In particular, Browning suggests that the marginal deadweight loss of taxation can vary considerably if one changes assumptions about some key parameters that describe the labor market.

4. For example, in the United States the percentage incidence of farm programs expenditure on total government receipts in the last five years has varied between 3.85 percent in 1986 and 1.15 percent in 1990 (U.S. Bureau of Census).

5. Thus, uniqueness for an interior solution with $R > 0$ is not automatically guaranteed; a sufficient condition for our problem would be $D''(P_d) \leq 0$.

6. See, for example, Dixit [but note that there is a typographical error in his equation (17); a formula equivalent to our equation (9) is found by solving correctly his equation (16)].

7. Modeling the large exporter case in the same fashion, we find that optimality typically requires a commodity tax in the agricultural market, and an export tax to improve the international terms of trade and exploit market power. Again, however, the latter does not depend on the fact that there is a (constant) marginal cost of taxation, nor does it depend on the existence of an income redistribution goal. Income support to farmers is still best achieved by decoupled transfers.

8. Considering the small exporter situation as a special case of the large exporter situation discussed in footnote 7, we find that production should take place at world prices (no export tax), that a commodity tax is warranted given positive marginal cost of taxation elsewhere in the economy, and that decoupled subsidies are still the optimal means of transferring income to farmers.

9. In fact, Alston and Hurd suggest that a combination of three instruments (a tariff, a production quota set at the free trade supply, and a per-unit subsidy) would be superior to a tariff alone. Such a conclusion is consistent with our results (subject to the qualifications discussed below)

because the suggested policy is equivalent to a decoupled transfer implemented in a market already distorted by taxation.

10. Note that these general equilibrium results are exactly equivalent to the optimal conditions for commodity taxation in a many consumers economy. See, for example, Atkinson and Stiglitz, and Sandmo.

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