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The (Normative) Efficiency Ranking of Output and Export Subsidies under Costly and Imperfect Enforcement

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Abstract

This paper relaxes the assumption of perfect and costless policy enforcement implicit in traditional analysis of output and export subsidies and introduces enforcement costs and cheating into the economic analysis of these policy instruments. Analytical results show that compliance with policy rules is not the natural outcome of self-interest and complete deterrence of cheating is not economically efficient. The introduction of enforcement costs and cheating changes the welfare effects of the policy mechanisms, their efficiency in redistributing income to producers, and their normative ranking in terms of transfer efficiency.

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The (Normative) Efficiency Ranking of Output and Export Subsidies under Costly and Imperfect Enforcement

Traditional analysis of farm subsidies takes place under the assumption that policy enforcement is perfect and costless. In such a world, the welfare effects of output and export subsidies as well as their efficiency in transferring income to producers depend on market conditions, the production share consumed domestically, the deadweight losses from taxation, and the level of government intervention in agriculture (see Gardner 1983, 1987, 1995; Alston and Hurd 1990; Alston, Carter and Smith 1993, 1995).

Policy enforcement is not costless however. Monitoring farmers' actions and convicting the detected cheaters requires government resources. The enforcement costs might result in enforcement that is imperfect which, in turn, creates economic incentives for farmers to cheat. Under an output or an export subsidy scheme farmers might find it beneficial to misrepresent their production or exports and collect government payments on greater quantities than those actually produced or exported. Cases of cheating on output and export subsidies are often reported by the European press. A recent report on the extent of cheating in the provision of farm subsidies in the European Union estimates the payments for "phantom" production and exports to \$4 billion per year (Journal of Commerce, 1997; Gardner, 1996).

The objective of this paper is to relax the conventional assumption of perfect and costless policy enforcement and to introduce enforcement costs and farmer misrepresentation into the economic analysis of output and export subsidies. The paper examines the economic causes of cheating and its consequences for the welfare effects of the policy instruments, their efficiency in redistributing income to producers, and their normative ranking in terms of transfer efficiency for the large country case.¹ The framework of analysis used in this paper is similar to the one developed by Giannakas (1998) and Giannakas and Fulton (2000) when examining the consequences of cheating for the welfare effects and the transfer efficiency of

¹ Even though there might be reasons for the employment of export subsidies other than income redistribution (such as increasing the domestic country's share of the world market or the provision of strategic advantage to domestic firms/oligopolists of the subsidized commodity), central in this analysis is the presumption that the sole purpose of government intervention is to transfer income to domestic producers of the subsidized commodity. The paper views export and output subsidies as income redistributive measures and compares them based on their transfer efficiency under costly and imperfect enforcement.

output quotas, output subsidies, and a combination of quota and subsidy in the context of a closed economy.

Similar to the findings of these studies, analytical results of this paper show that compliance with policy rules is not the natural fruit of farmer self-interest and deterrence of cheating is not economically optimal. The introduction of enforcement costs and farmer misrepresentation changes the welfare effects of output and export subsidies, and both the absolute and the relative transfer efficiency of the policy instruments. When enforcement is costly and cheating occurs, exports subsidies are relatively more efficient means of income redistribution than it is traditionally believed.

The rest of the paper is as follows. Section II examines the economic causes of cheating and its consequences for the welfare effects of output and export subsidies. Sections III.A and III.B analyze the effects of cheating on the transfer efficiency and the normative ranking of the policy mechanisms, respectively. Section IV extends the analysis to the case where penalties are endogenous to agricultural policy makers. Section V summarizes and concludes the paper.

II. Optimal Misrepresentation and Welfare Implications

When a subsidy scheme is in effect with subsidies linked to the output produced or to the output exported farmers might find it beneficial to cheat on the program by misrepresenting the quantity produced or the quantity exported and collect government payments on phantom production or exports. Assuming that the farmers know with certainty the level of the (output or export) subsidy, the penalty in case they are caught cheating, and the probability that they will be detected, the problem faced by the individual farmer can be seen as decision making under uncertainty. More specifically, the farmer has the choice between a certain outcome (i.e. his profits if he does not cheat) and an expected payoff in case he misrepresents the level of production or exports. In the simplest case, consider a risk-neutral farmer that decides on the quantity to produce and the quantity to misrepresent. The problem of the representative farmer can be written as:

$$(1) \quad \max_{q_t, q_m} E[\Pi] = (p_w + v)q_t - c(q_t) + [(1 - \delta)v - \delta\rho]q_m$$

where q_t is the quantity produced; q_m is the quantity reported as eligible for government payments over and above the quantity produced in the case of output subsidies or the quantity exported in the case of export subsidies; p_w is the world price of the subsidized commodity; v is the per unit (output or export) subsidy that makes up the difference between some domestic “target” price p_t and the lower world price p_w ; $c(\bullet)$ is the cost function; ρ is the penalty paid per unit of misrepresented and detected quantity; and δ is the probability that the farmer will be detected (and penalized) in case he cheats on the farm programs.

The detection probability takes values between zero and one (i.e. $\delta \in [0, 1]$) and is assumed to be a linear function of the quantity misrepresented i.e. $\delta_0 + \delta_1 q_m$. This formulation of the detection probability captures the idea that the more a farmer cheats, the greater is the likelihood that cheating will be detected. The intercept of the detection probability function, δ_0 , reflects the probability that the farmer will be audited. The audit probability δ_0 is assumed to be function of the resources spent by policy enforcers in investigating farmers, Φ , where δ_0 increases with an increase in Φ , although at a decreasing rate (i.e. $\delta_0'(\Phi) \geq 0$, $\delta_0''(\Phi) \leq 0$).

The slope of the detection probability function (i.e. the change in δ caused by a change in α_m), δ_1 , is strictly positive and is assumed to be exogenous to policy enforcers. The parameter δ_1 is assumed to depend on the observability of farmers’ actions by third parties and the social attitudes towards cheating; the degree to which the third party that observes the illegal behavior will report it to policy enforcers. The very existence of a USDA “hotline” where cases of “fraud” related to “submission of false claims/statements” can be reported (obviously by third parties) indicates that the variable component of the detection probability is considered an important element of policy enforcement (www.usda.gov/oig/hotline.htm).

The objective function of the representative farmer in equation (1) consists of the profits from farming in the presence of the (output or export) subsidy program, $\pi_f = (p_w + v)q_t - c(q_t)$, and the

expected benefits of misrepresentation, $EB_c = vq_m - \delta(v + \rho)q_m$. Optimization of the representative farmer's objective function yields the following first order conditions for a maximum:

$$(2) \quad \frac{\partial E[\Pi]}{\partial q_t} = 0 \Rightarrow p_w + v = c'(q_t)$$

$$(3) \quad \frac{\partial E[\Pi]}{\partial q_m} = 0 \Rightarrow \frac{v}{v + \rho} = \delta_0 + 2\delta_1 q_m$$

Equation (2) shows the standard result that the quantity produced, q_t , is determined by the equality of the price received by producers with the marginal cost of production; the production decisions of the farmer are not affected by any parameter associated with output misrepresentation.

Equation (3) shows that the optimal quantity misrepresented is determined by equating the ratio of the benefits from cheating that goes undetected over the effective penalty for the misrepresented quantity that is expected to be penalized, $\frac{v}{v + \rho}$, and the marginal penalized output (mpo), $\delta_0 + 2\delta_1 q_m$.

mpo shows the change in the quantity that is expected to be penalized (i.e. δq_m) for a change in the quantity misrepresented. The optimal quantity to misrepresent, q_m , is determined graphically by the intersection of a horizontal line at $\frac{v}{v + \rho}$ and line mpo in Figure 1. The expected benefits from

misrepresentation, EB_c , are illustrated by the shaded area in the same Figure. The expected benefits from cheating and q_m are both positive whenever δ_0 is lower than $\frac{v}{v + \rho}$.²

Mathematically, the optimal quantity to misrepresent by the representative farmer is given by:

² Note that if δ_0 exceeds $\frac{v}{v + \rho}$ farmers will find it optimal to truthfully report their production or exports (i.e. $q_m = 0$).

$$(4) \quad q_m = \frac{v - \delta_0(v + \rho)}{2\delta_1(v + \rho)}$$

while the total quantity misrepresented by N representative producers of the subsidized commodity equals

$$(5) \quad Q_m = Nq_m = \frac{v - \delta_0(v + \rho)}{2\delta_1'(v + \rho)} \quad \text{where } \delta_1' = \frac{\delta_1}{N}$$

Panels (a) and (c) of Figure 2 graph the determination of the total quantity misrepresented under an output subsidy, Q_m^{os} , and an export subsidy, Q_m^{es} , respectively, while Panel (b) of the same Figure depicts the determination of p_w under the two subsidy schemes. The aggregate misrepresentation is determined by the intersection of a horizontal line at $\frac{v}{v + \rho}$ with the relevant MPO curve when they are graphed relative to the origins of O in Panels (a) and (c) of Figure 2. The MPO curves are the horizontal summation of the individual farmers' mpo curve in Figure 1. The MPO curves have an intercept of δ_0 while their slopes equal $2\delta_1/N$. Consistent with *a priori* expectations, Q_m increases with an increase in the subsidy payment and decreases with an increase in the detection probability and per unit penalty parameters (i.e. $\frac{\partial Q_m}{\partial v} > 0$, $\frac{\partial Q_m}{\partial \delta_0} < 0$, $\frac{\partial Q_m}{\partial \delta_1'} < 0$ and $\frac{\partial Q_m}{\partial \rho} < 0$).

When the combination of the policy variable and the enforcement parameters is such that cheating occurs (i.e. $Q_m > 0$), the traditional analysis of the policy instruments fails to consider the aggregate expected benefits from misrepresentation to producers, $EB_c = [v - \delta(v + \rho)]Q_m$. These benefits come at the expense of taxpayers and are shown by the (shaded) areas EB_c^{os} and EB_c^{es} in Panels (a) and (c) of Figure 2 respectively.

It is important to realize that both the extent of misrepresentation and the benefits from cheating to producers differ under the two subsidy schemes. The reason is that the level of the subsidy that

achieves a given domestic producer price, p_t , is always greater under an export subsidy when the domestic country faces a downward sloping export demand curve (i.e. $v^{es}(=p_t - p_w^{es}) > v^{os}(=p_t - p_w^{os})$).³ The relatively higher export subsidy results in increased economic incentives to cheating; both the quantity misrepresented and the producer benefits from cheating are greater when the exporting country subsidizes exports rather than output (i.e. $Q_m^{es} > Q_m^{os}$ and $EB_c^{es} > EB_c^{os}$ where $Q_m^{es} = \frac{v^{es} - \delta_0(v^{es} + \rho)}{2\delta_1'(v^{es} + \rho)}$,

$$Q_m^{os} = \frac{v^{os} - \delta_0(v^{os} + \rho)}{2\delta_1'(v^{os} + \rho)}, EB_c^{es} = [(1 - \delta)v^{es} - \delta\rho]q_m^{es}, \text{ and } EB_c^{os} = [(1 - \delta)v^{os} - \delta\rho]q_m^{os}.^4$$

Since the transfer to producers through misrepresentation is greater under an export subsidy, when output and export subsidies are set such that the same p_t is achieved under both subsidy schemes the *total* transfer to producers (i.e. transfer through the market plus transfer through cheating) is always greater when an export subsidy is in place (i.e. $\Delta PS_c^{es}(=\Delta PS_{pce}^{es} + EB_c^{es}) > \Delta PS_c^{os}(=\Delta PS_{pce}^{os} + EB_c^{os})$ where $\Delta PS_{pce}^{es} = A' + A'' + B$ and $\Delta PS_{pce}^{os} = A + B$ in Panels (c) and (a) of Figure 2 respectively, while the subscripts c and pce stand for cheating and perfect and costless enforcement, respectively).

Other than the transfer to producers through misrepresentation, taxpayers also fund the subsidy payments on actual output as well as the costs of monitoring farmers' actions. The monitoring and enforcement costs, $\Phi(\delta_0)$, are assumed to be an increasing function of δ_0 (i.e. $\Phi'(\delta_0) \geq 0$, $\Phi''(\delta_0) \geq 0$) and even though not present in the stylized Figure 2, should be included into both the budgetary costs and the deadweight welfare losses (DWL) from output and export subsidies.

³ Due to the reduced domestic consumption (and, thus, the increased quantity that has to be disposed to the world market) under an export subsidy scheme, the world price has to be reduced more than would be "required" for the market to clear if an output subsidy was in place (i.e. $p_w^{es} < p_w^{os}$). Lower world price under an export subsidy means increased subsidy that achieves the targeted producer price in the domestic market.

⁴ It should be noted that this result is not valid when a small open economy is concerned. Since, by definition, the small country-exporter of the subsidized commodity faces a perfectly elastic export demand curve, the domestic policy choices have no effect on the world price. The consequence of this is that the subsidy that achieves some (any) given increase in domestic producer price is the same (i.e. $v = p_t - p_w$) no matter if it is the exported surplus or the total production of the small country that is subsidized. Thus, both the extent of cheating and the transfer to producers through misrepresentation are the same under an export subsidy and an output subsidy scheme when those are considered in the context of a small open economy.

More specifically, the taxpayer costs under an output subsidy and an export subsidy scheme equal $(1+d)[ABCDEF + EB_c^{OS} + \Phi(\delta_0)]$ and $(1+d)[A''BCGHI + EB_c^{ES} + \Phi(\delta_0)]$ respectively, where d is the marginal deadweight loss from taxation (Ballard and Fullerton), while the deadweight losses from output and export subsidies equal $DWL_c^{OS} = d(AB + D + EB_c^{OS}) + (1+d)[CEF + \Phi(\delta_0)]$ and $DWL_c^{ES} = d(B + EB_c^{ES}) + (1+d)[A''CGHI + \Phi(\delta_0)]$, respectively.⁵ Relative to the situation in a world where policy enforcement is perfect and costless, enforcement costs and cheating increase the DWL of output and export subsidies by $dEB_c^{OS} + (1+d)\Phi(\delta_0)$ and $dEB_c^{ES} + (1+d)\Phi(\delta_0)$ respectively (i.e. $DWL_c^{OS} = DWL_{pce}^{OS} + dEB_c^{OS} + (1+d)\Phi(\delta_0)$ and $DWL_c^{ES} = DWL_{pce}^{ES} + dEB_c^{ES} + (1+d)\Phi(\delta_0)$).

III. Output Misrepresentation and Transfer Efficiency

After having analyzed the economic causes of output misrepresentation and its consequences for the welfare effects of output and export subsidies, this section of the paper examines the effects of enforcement costs and cheating on the transfer efficiency⁶ of the policy instruments and their (normative) ranking in terms of their efficiency in redistributing income to agricultural producers. The transfer efficiency and the ranking of the policies under perfect and costless enforcement are used as benchmark for the analysis.

III.A. Optimal Enforcement and Transfer Efficiency

The previous analysis and results indicate that the amount of cheating depends on the level of the (output or export) subsidy and the detection probability and per unit penalty parameters. Since, however, δ_1 has

⁵ Since cheating results in decoupled transfers from taxpayers to producers, consumer welfare is not affected by output misrepresentation; consumer surplus increases by area D in Panel (a) of Figure 2 when an output subsidy scheme is in effect, while when an export subsidy is used to transfer income to producers, the (domestic) market price rises to p_t and consumer welfare is reduced by the areas $A' + A''$ in Panel (c) of Figure 2.

⁶ The transfer efficiency (efficiency in redistribution) links the distortionary costs of market intervention to the surplus transferred to producers; the lower are the welfare losses associated with a given transfer to producers, the greater is the efficiency of the policy instrument in transferring income to producers.

been assumed exogenous to policy enforcers and since penalties are usually set by the legal system, the only avenues agricultural policy makers have for influencing the behavior of farmers is through the choice of v and δ_0 .

More specifically, a *ceteris paribus* increase in δ_0 reduces both the quantity misrepresented and the expected benefits from cheating (i.e. $\frac{\partial Q_m}{\partial \delta_0} < 0$ and $\frac{\partial EB_c}{\partial \delta_0} < 0$). At the same time the higher δ_0 means increased monitoring and enforcement costs of the program (since by assumption $\Phi'(\delta_0) \geq 0$). Similarly, a change in v changes producer surplus in the same direction through the effect of the subsidy on the transfer to producers through the market (i.e. $\frac{\partial \pi}{\partial v} > 0$) and the transfer to producers through cheating (i.e. $\frac{\partial EB_c}{\partial v} > 0$). The change in the subsidy changes also the deadweight losses associated with (output and export) subsidies in the same direction (i.e. $\frac{\partial DWL_c}{\partial v} > 0$).

The implication of this is that agricultural policy makers can reduce the welfare losses associated with a given transfer to domestic producers by simultaneously reducing v and δ_0 . The reasoning is as follows. A lower v , reduces the surplus transferred to producers and the welfare losses from the program (i.e. the DWL triangles, the deadweight losses from taxation, and the transfers to foreign consumers of the subsidized commodity). This reduction in producer welfare can nevertheless, be compensated by a lower level of monitoring. The lower δ_0 increases output misrepresentation and the transfer to producers through cheating while at the same time reduces the monitoring and enforcement costs from the program.

Thus, a simultaneous reduction of v and δ_0 can lessen the total welfare losses from the programs while the same surplus is transferred to producers. The welfare losses associated with (any given) income redistribution are minimized (and the transfer efficiency of both output and export subsidies is

maximized) when δ_0 is set equal to zero.⁷ The optimal level of v is then determined by the rate at which agricultural policy makers wish to substitute consumer and taxpayer surplus with producer surplus.

When enforcement is costly and δ_0 is set at its optimal value (i.e. $\delta_0=0$) the transfer efficiency of output and export subsidies is given by equations (6) and (7) respectively as:

$$(6) \quad \left(\frac{DWL}{\Delta PS} \right)_c^{os} = \frac{DWL_{pce}^{os} + dEB_c^{os}}{\Delta PS_{pce}^{os} + EB_c^{os}} \text{ and}$$

$$(7) \quad \left(\frac{DWL}{\Delta PS} \right)_c^{es} = \frac{DWL_{pce}^{es} + dEB_c^{es}}{\Delta PS_{pce}^{es} + EB_c^{es}}$$

Equation (6) and (7) show that if output and export subsidies are less efficient means of income redistribution than lump-sum transfers to producers in a world where policy enforcement is perfect and

costless (i.e. if $\left(\frac{DWL}{\Delta PS} \right)_{pce}^{os} > d$ and $\left(\frac{DWL}{\Delta PS} \right)_{pce}^{es} > d$), the transfer efficiency of the policy instruments is

greater than it is traditionally believed (i.e. $\left(\frac{DWL}{\Delta PS} \right)_c^{os} < \left(\frac{DWL}{\Delta PS} \right)_{pce}^{os}$ and $\left(\frac{DWL}{\Delta PS} \right)_c^{es} < \left(\frac{DWL}{\Delta PS} \right)_{pce}^{es}$). Farmer

misrepresentation increases the transfer efficiency of both output and export subsidies since it allows agricultural policy makers to substitute distortionary transfers through the market with more efficient (decoupled) transfers through cheating.

The surplus transfers to producers through cheating result in an income redistribution that approximates more closely a (more efficient) lump-sum transfer policy. Therefore, the Surplus

⁷ Note that, setting δ_0 equal to zero does not mean that cheating goes undetected. Since δ_1 is (assumed) strictly positive, zero δ_0 means that agricultural policy makers will not actively spend resources to deter cheating over and above that would occur otherwise. When δ_0 is reduced to zero, the MPO curve comes out from the origin (point O in Panels (a) and (c) of Figure 2) and

cheating on the programs is maximized (i.e. $Q_m^{os} = \frac{v^{os}}{2\delta_1'(v^{os} + \rho)}$ and $Q_m^{es} = \frac{v^{es}}{2\delta_1'(v^{es} + \rho)}$).

Transformation Curves (STC)⁸ for output and export subsidies under costly and imperfect enforcement, STC_c , will lie above those proposed by the traditional agricultural policy analysis, STC_{pce} , for every positive level of intervention (i.e. everywhere to the left of point E in Figure 3).

III.B. Normative Ranking of Output and Export Subsidies

After having proved that cheating increases the transfer efficiency of both output and export subsidies, the question that naturally arises is whether and to what extent enforcement costs and cheating affect the relative transfer efficiency and, therefore, the normative ranking of the policy mechanisms under consideration. More specifically, the analysis shows that cheating increases the transfer efficiency of both output and export subsidies; the greater is output misrepresentation, Q_m , the greater are the producer benefits from cheating, EB_c , and the greater is the efficiency of output and export subsidies in

transferring income to producers, $\frac{DWL_{pce} + dEB_c}{\Delta PS_{pce} + EB_c}$, relative to the perfect and costless enforcement case.

The analysis also shows that when output and export subsidies are structured such that the same “target” price is received by producers, the extent of misrepresentation and the benefits to producers from cheating under an export subsidy are greater than those under an output subsidy scheme (i.e. $Q_m^{es} > Q_m^{os}$ and $EB_c^{es} > EB_c^{os}$). Since the increase in transfer efficiency is proportional to the level of cheating and since more cheating occurs when an export subsidy is in effect, the transfer efficiency of export subsidies increases more than the transfer efficiency of output subsidies when cheating is included into the analysis.

The implication of this is that the incorporation of output misrepresentation into the analysis increases the likelihood that an all-or-nothing choice between output subsidies and export subsidies on the

⁸ A surplus transformation curve depicts the trade off between producer surplus and consumer plus taxpayer surplus for different levels of intervention (Gardner, 1983). The slope of the STC, denoted as $s = \frac{\partial PS}{\partial (CS+TS)}$, is the marginal rate of surplus

transformation. It shows the efficiency of the policy mechanism in redistributing income to producers at the margin; how much of an extra dollar raised by consumers and taxpayers is received by producers. One minus the absolute value of s shows the deadweight loss per dollar transferred at the margin.

grounds of transfer efficiency will favor export subsidies. Put in a different way, the introduction of cheating can change the ranking of the policies making export subsidies more efficient but it will never change the ranking making output subsidies relatively more efficient than export subsidies.⁹

Mathematically, the effect of cheating on the ranking of the output and export subsidies can be shown using the expressions for the transfer efficiency of the policies in equations (6) and (7). More specifically, the relative transfer efficiency of the subsidies is contingent upon the sign of the expression

$$(8) \quad \Delta PS_{pce} \left(DWL_{pce}^{os} - DWL_{pce}^{es} \right) + d\Delta PS_{pce} \left(EB_c^{os} - EB_c^{es} \right) + DWL_{pce}^{os} EB_c^{es} - DWL_{pce}^{es} EB_c^{os}$$

A positive sign of the expression in equation (8) indicates that export subsidies are more efficient than

output subsidies when enforcement is costly and imperfect (i.e. $\frac{DWL_{pce}^{os} + dEB_c^{os}}{\Delta PS_{pce}^{os} + EB_c^{os}} > \frac{DWL_{pce}^{es} + dEB_c^{es}}{\Delta PS_{pce}^{es} + EB_c^{es}}$),

while a negative sign indicates the opposite.¹⁰

Consider first the case where both subsidies are equally efficient under perfect and costless enforcement. In such a case, $DWL_{pce}^{os} = DWL_{pce}^{es}$ and the expression in equation (8) can be re-written as

$\left(DWL_{pce}^{os} - d\Delta PS_{pce} \right) \left(EB_c^{es} - EB_c^{os} \right)$ which is clearly positive since output subsidies are always less

efficient than lump-sum transfers to producers, $\frac{DWL_{pce}^{os}}{\Delta PS_{pce}^{os}} > d$, and also $EB_c^{es} > EB_c^{os}$. Thus, when output

and export subsidies are equally efficient under perfect and costless enforcement, the incorporation of cheating results in export subsidies being relatively more efficient.

⁹ The fact that cheating can change the normative ranking of output and export subsidies by increasing the transfer efficiency of export subsidies relatively more holds only for the large country case. In the context of a small open economy, the reason for this asymmetric increase in efficiency, namely the increased cheating that occurs under an export subsidy scheme is no longer valid. As noted in footnote 4, the benefits to producers from cheating are the same under output and export subsidies when those are adopted by a small open economy. Thus, in the small country case cheating increases the transfer efficiency of both types of subsidies by the same amount and the ranking of output and export subsidies remains unaffected.

¹⁰ Note that since both subsidies result in the same increase in domestic price, the transfers to producers through the market effects of the policies are the same (i.e. $\Delta PS_{pce}^{es} = \Delta PS_{pce}^{os}$).

When output subsidies are more efficient in a world of costless enforcement (i.e. when $DWL_{pce}^{os} < DWL_{pce}^{es}$), the incorporation of cheating into the analysis could make export subsidies more efficient than output subsidies (i.e. could make the expression in equation (8) positive). Finally, if it is export subsidies that are more efficient under perfect and costless policy enforcement (i.e. if $DWL_{pce}^{os} > DWL_{pce}^{es}$), the expression in equation (8) is always positive; the incorporation of cheating can never change the ranking of the policies making output subsidies more efficient than export subsidies.

IV. Extension of the Model - Endogenous Penalties

The previous analysis and results are based on the assumption that penalties are set by the legal system and are, therefore, exogenous to agricultural policy makers. This section relaxes this assumption and examines the incidence of subsidies on output and exports in an environment where agricultural policy makers control both audit probability and the penalties charged on detected misrepresentation.

Assuming that there are no economic costs associated with the establishment of fines for producers detected cheating on farm programs, policy enforcement is potentially costless when penalties are endogenous. More specifically, policy makers can always set the (costly) audit probability equal to zero and increase penalties to the level at which misrepresentation is completely deterred. Substituting δ_0 for zero in equation (5) and solving for the penalty that results in zero misrepresentation shows that, when penalties are endogenous, cheating can be completely and costlessly deterred by the establishment of infinite per unit fines.

Since cheating is perfectly and costlessly deterred when enormous fines are set, the welfare effects of the two policy instruments under consideration, their efficiency in redistributing income and their normative ranking in terms of transfer efficiency are those derived by the traditional agricultural policy analysis. Thus, one interpretation of the assumption of “perfect and costless enforcement” that is implicit in the traditional framework of agricultural policy analysis, is the costless imposition of enormous fines for farmers caught cheating on farm programs.

Even though the severe punishment of law violators is a standard result in the crime literature (Becker, 1968), the establishment of infinite penalties for farmers cheating on subsidies is neither realistic nor credible, or costless, or just. And certainly it is not the most economically efficient way of redistributing income to producers (compare STC_{pce} with STC_c in Figure 3).

When penalties are endogenous, agricultural policy makers will always find it economically optimal to completely allow misrepresentation by setting both enforcement parameters equal to zero. This is true no matter if output or export subsidies are used. The reasoning is as follows. By setting both enforcement parameters equal to zero output misrepresentation is maximized. Increased misrepresentation means increased producer benefits from cheating. The greater are the benefits from cheating, the lower is the level of the (output or export) subsidy required for a given surplus to be transferred to producers. Reduced subsidy means reduced welfare losses associated with the specific income redistribution and increased transfer efficiency of the policy instruments (the relevant STC for output and export subsidies lies above STC_c in Figure 3). Thus, when subsidy, audit probability, and penalties are endogenous, complete allowance of cheating is the economically optimal choice of agricultural policy makers.

Graphically, the optimal Q_m is determined by the intersection of an MPO curve that comes out from the origin and a horizontal line at 1 (i.e. v/v) under both types of subsidy. This implies that the same amount of cheating will occur under both policy regimes (i.e. $Q_m^{os} = Q_m^{es} = \frac{1}{2\delta_1}$). The producer benefits

from misrepresentation equal $EB_c = \frac{v}{4\delta_1}$. Since the export subsidy that achieves the domestic “target”

price is greater than the relevant output subsidy, producer benefits from cheating under an export subsidy are greater than the benefits when an output subsidy is in effect. Based on the previous analysis, cheating increases the transfer efficiency of both output and export subsidies but increases the efficiency of export subsidies relatively more; the basic result of this paper remains unaffected.

These results should be treated carefully, however, since all the relevant benefits and costs have not been examined. Institutionalization of the (economically optimal) zero fines for farmers cheating on subsidies could soften moral constraints to illegal behavior and create a culture of dishonesty in the society and a public disrespect for both the government and community rules (Lea, Tarpy and Webley, 1987; Cowell, 1990). The expected social costs of such a situation might outweigh the economic efficiency gains from farmer misrepresentation and make deterrence of cheating the optimal choice of policy makers.

V. Concluding Remarks

This paper relaxes the assumption of perfect and costless policy enforcement that is implicit in the traditional analysis of output and export subsidies and introduces enforcement costs and farmer misrepresentation into the economic analysis of these policy instruments. Analytical results show that compliance with policy rules is not the natural fruit of farmer self-interest and deterrence of cheating is not economically efficient. Output misrepresentation results in lump-sum (decoupled) transfers from taxpayers to producers of the subsidized commodity. Deterrence of cheating eliminates these transfers and requires resource costs that constitute social welfare losses. Thus, deterrence is not economically optimal.

The surplus transfers to producers through cheating result in an income redistribution that approximates more closely a (more efficient) lump-sum transfer policy. Put in a different way, the extra benefits to producers from cheating mean that the regulator can reduce the level of market intervention (i.e. the subsidy) that transfers a given surplus to producers. The substitution of (some) distortionary transfers through the market with more efficient lump-sum transfers through cheating result in increased transfer efficiency of both types of subsidies; output and export subsidies are more efficient means of income redistribution than it is traditionally believed.

The increase in transfer efficiency due to cheating is greater for the export subsidies however. The reason is that relatively more cheating occurs when a (large) country subsidizes exports rather total

domestic production. Put in a different way, output misrepresentation increases the transfer efficiency of both output and export subsidies but increases the transfer efficiency of export subsidies by more.

The implication of this is that the likelihood that an all-or-nothing choice between output subsidies and export subsidies on the grounds of transfer efficiency will favor export subsidies is increased when the unrealistic assumption of “perfect and costless enforcement” is relaxed and farmer misrepresentation is introduced. This finding could provide an alternative justification for, and explanation of, the extensive use of export subsidies by large “countries” like the EU where enforcement of agricultural policies is imperfect and farmer misrepresentation and cheating well documented.

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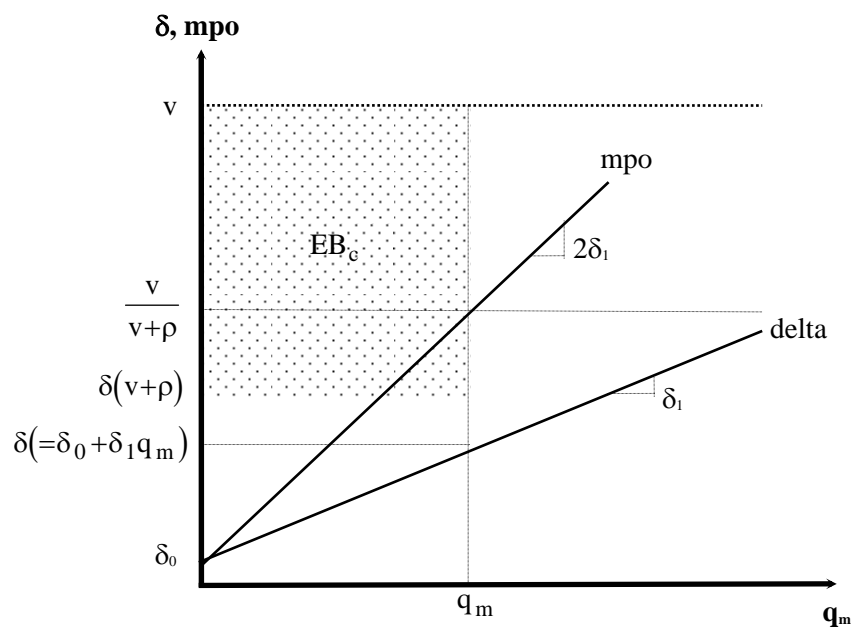


Figure 1. Misrepresentation on Subsidies (Cheating Equilibrium)

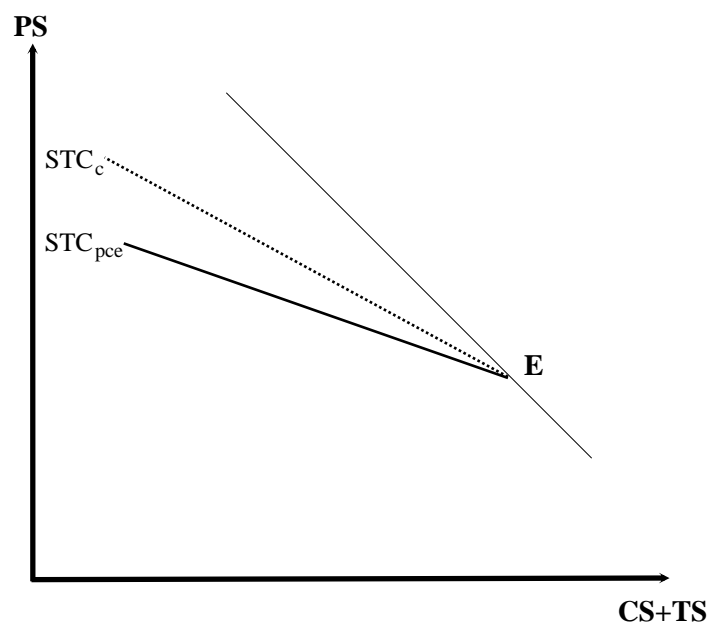


Figure 3. Surplus Transformation Curves for Output and Export Subsidies in the Presence of Misrepresentation

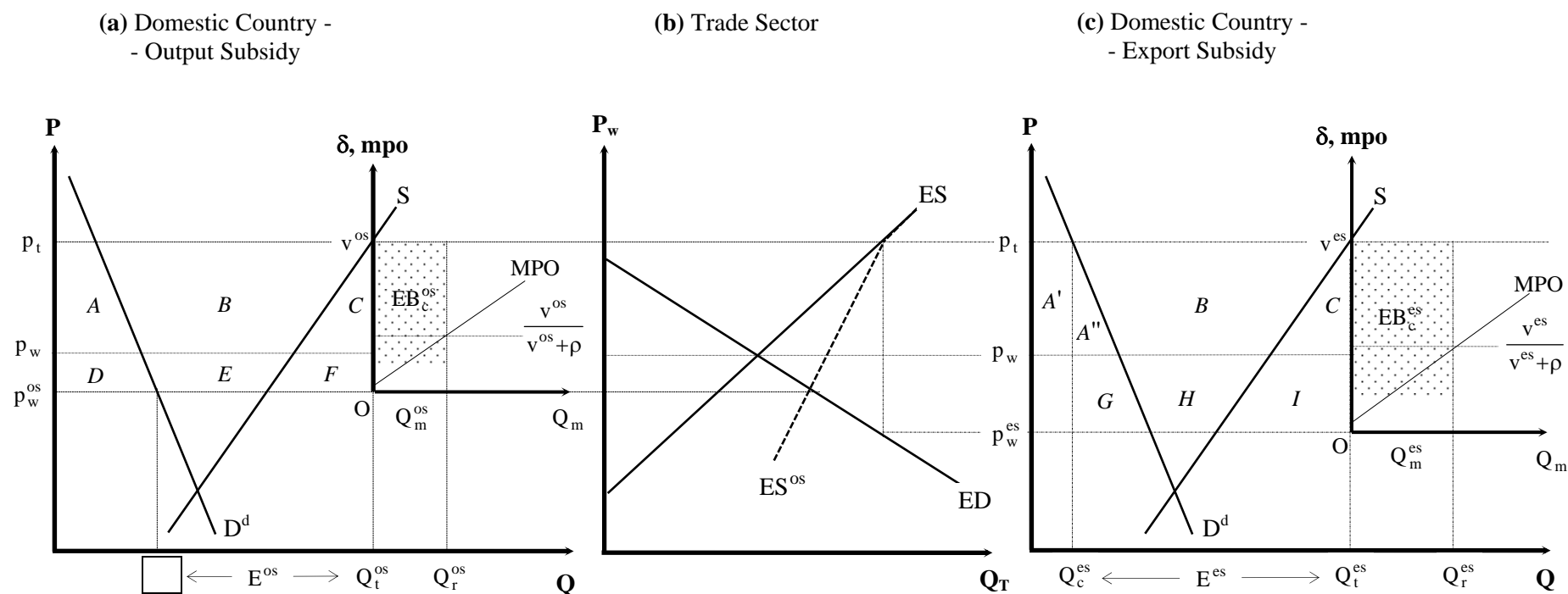


Figure 2. The Welfare Effects of Output and Export Subsidies under Costly Enforcement and Misrepresentation in a Large Country