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THE TRADE DISTORTING EFFECT OF SINGLE-DESK STATE TRADING EXPORTERS

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The trade distorting effect of single-desk exporting State Trading Enterprises

Steve McCorriston and Donald MacLaren

State trading enterprises (STEs) may be high on the agenda in the forthcoming WTO negotiations on agricultural trade. Much of the concern of many countries appears to be that the existence of STEs distort competition on export markets and act in a manner similar to the use of export subsidies. It is shown in this paper, inter alia, that the trade distorting effect of STEs depends on the specification of the underlying benchmark against which to gauge the impact of the state trading enterprise, i.e. whether domestic and/or world markets are characterised as being competitive or oligopolistic.

Introduction

The existence of state trading enterprises (STEs) may be high on the agenda in the forthcoming WTO negotiations on agricultural trade. For example, in recent months, the United States in the submission of its preliminary negotiation agenda to the WTO has highlighted state trading enterprises in both importing and exporting countries as a matter to be dealt with. Most of the major agricultural trading nations (with the exception of the European Union) have notified the WTO about the existence of an STE as part of their overall policy framework for influencing agricultural trade. For example, Japan has notified the WTO of the existence of the Japan Food Agency as an STE, while agricultural exporters such as Canada, Australia and New Zealand have all notified the existence of STEs. The United States has also previously notified that the Commodity Credit Corporation is an STE.

It should be highlighted at the outset that STEs are not prohibited under GATT/WTO Articles. Since 1947, the role of STEs in world trade has been recognised in the GATT, though their behaviour is subject to the constraints imposed by GATT Articles, specifically, but not confined to, Articles II and XVII. Coupled with a self-notification process, the rules of GATT are aimed at making the effects of STEs on world trade no different from the effects of (competitive) private firms. However, one long-standing problem has been to define precisely what is meant by an STE. The previous definition was clarified in the legal text of the Uruguay Round

Agreement where an STE was defined as: 'government and non-governmental enterprises, including marketing boards, which have been granted exclusive or special rights or privileges, including statutory or constitutional powers, in the exercise of which they influence through their purchases or sales the level or direction of imports or exports' (WTO 1995, p. 25). On the basis of notifications, the Working Party has identified seven major types of STE. However, despite the restrictions on the practices of STEs, the fact that the STE issue may be on the WTO agenda for agricultural trade negotiations indicates that many WTO members perceive the current GATT/WTO framework for dealing with their incidence throughout the world economy and their impact on agricultural trade as being inadequate.

In this context, several commentators have suggested measuring the trade distorting impact of STEs, see for example Dixit and Josling (1997). The idea of measuring the trade distorting impact of STEs has a long history and dates back, most notably, to Lloyd (1982)[1]. The central idea is straightforward in principle. Take, for example, the case of a monopoly exporter that sells the good in the world market and there is no domestic consumption. As the monopoly exporter in an otherwise competitive world market, the monopoly exporter will limit its exports in order to create and benefit from monopoly rent. The presence of the monopoly exporter would then be equivalent to the imposition of an export tax in the absence of the monopoly (STE) supplier. Similarly, in the importer country case, the STE would limit imports and sell the good in the domestic market at a (monopoly) level in excess of the world market price (and might also generate terms of trade benefits in the purchase of imports from the world market). Given that a wedge has been created between the domestic and world prices, an import tariff would be equivalent to the practices of the STE. From Lloyd through to Dixit and Josling, the implication is that the trade distorting impact of the STE can be measured and, by extension, could then be used as part of the trade negotiations to identify those STEs that have a significant effect on world trade and those that do not. However, as outlined below, this basic framework may be too simplistic for capturing some of the essential features of STEs. For example, the previous literature on measuring the trade distorting impact of STEs

[1] In fact, the idea that STEs are comparable to trade policy instruments pre-dates Lloyd (1982). Meade (1955) noted that: 'In an economic system in which either activities are carried on in a more or less free competitive regime the consequences of the State monopolisation of production, consumption, or trade in any commodity are essentially similar to the consequences of State intervention through taxes or subsidies and through quantitative restrictions'. (Meade, 1955, p.176).

has not accounted for the existence of single-desk STEs that can sell in both domestic and export markets and where both of these markets, to varying degrees, may be imperfectly competitive. Such STEs require the definition of a different benchmark from that assumed in earlier studies.

While the broad topic of STEs may be on the negotiating agenda, the specific concerns of many countries are the STEs which have 'single-desk' status, i.e. where, in the case of exporting countries, the STE has the sole right to procure most of the agricultural commodity and sell it in both the domestic and export markets. In the case of importing countries, single-desk status implies that the STE has sole right to import and then to sell on the domestic market. For non-STE exporting countries, the specific concern of single-desk STE exporters is that they can segment the domestic and export markets and increase their returns through price discriminating between the two markets. The concern with respect to single-desk importers relates primarily to market access considerations and to the possibility of mark-ups in excess of tariff bindings. Taken together, the overall issue with respect to STEs on the agricultural negotiating agenda lies with the suspicion that even if import tariffs, tariff-rate quotas and export subsidies were fully eradicated, the continued presence of STEs would serve as a remaining distortion to agricultural trade.

The focus of this paper is on the potential trade distorting effects of single-desk STE exporters. This focus is justified by the fact that the US, in its preliminary submission to the WTO, has specifically identified the single-desk status of STEs as its principal concern (USDA, 2000). For once on matters of agricultural trade, the European Union is in agreement with the United States as the EU has indicated that it is willing to negotiate on export subsidies if the impact of STEs are also included on the negotiating agenda. Moreover, the U.S. has had a long history of disputes over the practices of the Canadian Wheat Board and the Australian Wheat Board and has expressed concern that the single-desk practices of these STEs give them advantages in world markets that would not be available to private firms (cf. the General Accounting Office and US International Trade Commission investigations into these Boards in the 1990s)[2]. In this regard, the concern with the monopoly status of the

[2] A CUSTA panel also investigated in the early 1990s the claim by the US that the Canadian Wheat Board was 'dumping' grain in the US market. The US complaint was not upheld. Most recently, the U.S Commerce Department has concluded an investigation into the potential benefits received by Canadian cattle feeders due to the existence of the Canadian Wheat Board.

single-desk monopoly STEs is not that they sell ‘too little’ (and that the effect of the STE is similar to an export tax) but rather that the STE sells 'too much' and the STE is equivalent to an export subsidy[3].

In terms of measuring the trade distorting effects of single-desk STEs, there are two issues to be explicitly noted. First, as outlined above, it is assumed in the standard literature that the STE only exports with no explicit account being made for the domestic market. However, a single-desk STE can price discriminate between the domestic and export market in order to maximise returns by taking advantage of market segmentation and the differing elasticities of demand between domestic and foreign markets. The STE limits quantities sold in the domestic market and exports 'too much' to the world market. Thus the impact of the STE lies in both the domestic and foreign markets. As Watson (1999) has recently noted: 'Consciously or unconsciously, astute grain growers support the single desk [Australian Wheat Board] because of market power on the Australian market not the world market, as their rhetoric would have it'. However, the potential for price discrimination is not limited to single-desk STEs[4].

Second, in the previous literature on the trade policy equivalence of STEs, it has been assumed that the effect of the STE should be assessed relative to an otherwise competitive market. However, in determining the subsidy equivalence of an STE, defining the underlying benchmark is important and it may be inappropriate to characterise the alternative market structures as being perfectly competitive. In the context of forthcoming trade negotiations, the observation has been made by some pressure groups that STEs compete in markets characterised by the dominance of a few large multinationals[5]. Moreover, the agricultural trade literature has often focused on the nature of competition on world agricultural markets. This literature dates back to McCalla (1966) and has continued to the present with recent examples including, for example, Kolstad and Burris (1986) and Patterson and Abbott (1994) amongst others. Although there is much dispute on how competitive world agricultural markets are, in principle, it would certainly be relevant to allow for varying degrees of

[3] There are wider issues relating to STEs that we do not investigate in this paper namely the nature of government guarantees, the acquisition costs of the STE and cross-subsidisation between export markets. This paper, however, focuses primarily on exclusive rights of STEs, i.e. the single-desk nature of STEs

[4] Carter and Loyns (1998) make a similar observation with respect to the Canadian Wheat Board.

[5] See Murphy (1999) for an overview from the perspective of developing countries.

competition in deriving the underlying benchmark. Moreover, there is also a considerable literature on the extent of competition on domestic markets. In this context, it is not only a single-desk STE that can discriminate between domestic and world markets; private traders, to varying degrees, can also do this. Consequently, in measuring the subsidy-equivalent effect of STEs, it may be more appropriate to consider an underlying benchmark where both export and domestic markets are both potentially oligopolistic.

There are three further issues likely to be relevant in determining the trade distorting effects of STEs but which are not explored in the remainder of this paper.[6] First, it is important to consider the payoff function of the STE. One of the key ways in which a state enterprise differs from a private enterprise is the payoff function. In this paper, it is assumed that the STE represents producer interests and maximises producer returns (i.e. producer surplus) from marketing the product in both domestic and export markets. The price that producers receive is some composite of the domestic and export price. It is not assumed that this particular payoff function is necessarily representative of all STEs; but it is true that what makes a state enterprise most obviously different from a private firm is the difference in their payoff functions and is consistent with the literature on public enterprises. A joint-surplus maximising payoff function would appear to be consistent with the reasons for the existence of STEs and, more broadly, with nature of agricultural policy objectives in many developed countries but clearly there would be scope for considering other objective functions of STEs. On the other hand, the private firms are assumed to maximise their profits.

As an intermediate scenario between the private market outcome where firms can market their output on domestic and export markets and the case where this is undertaken by a single-desk STE, the case of licensed export firms which have the exclusive right to export (but not to sell on the domestic market) and which maximise profits may be considered. This case conforms to the scenario where the firm has exclusive rights to export but is distinct from the single-desk STE by the more limited nature of the exclusive rights and by its objective function. This scenario is relevant for many countries; for example, the Australian Wheat Board no longer has single-desk status even though it has sole rights to export Australian wheat to the world

[6] In longer version of the paper, the results for these three cases are derived.

market and is now beholden to its shareholders. Moreover, it should be noted that the licensed firm(s) would still be regarded as an STE according to GATT rules which defines an STE by the nature of 'exclusive rights and special privileges' which are not applicable to all firms. In other words, it is the designation of exclusive rights that matters with respect to the STE issue, not ownership.

The second issue relates to the observation that many agricultural markets in developed countries are regulated by means of price support that is typically independent from the actions of the STE because the level of these prices is usually established by the central government. Hence, in determining the trade distorting effects of an STE, there are two potential sources of distortion: the potential to discriminate effectively between markets owing to the single-desk status; and the level of government support policies that influences the supply of agricultural commodities. While the single-desk nature of the STE may be comparable to an implicit export subsidy, guaranteed producer prices set above the free market level will be equivalent to a tax on the STE.

The third issue relates to the perceived inefficiency of public firms. There is a considerable debate in the regulation literature on this issue although the evidence is inconclusive (see Laffont and Tirole, 1993). However, given the possibility that this inefficiency is true of STEs involved in agricultural markets, the impact it has in measuring the trade-distorting effect of STEs may be important. For example, Carter, Loyns and Berwald (1998) have noted that the Canadian Wheat Board is characterised by inefficiency because of the over-provision of marketing services. This inefficiency raises the costs of the STE, reduces the returns to producers, and influences the trade distorting effects of STEs on world markets.

The paper is organised as follows. In section 1, the underlying benchmark is set out and the role of the trade policy equivalent measure is discussed. This benchmark allows for varying degrees of competition as captured by the number of firms competing in the market. In section 2, the expressions for the trade-distorting effects of the single-desk STEs are derived formally. In section 3, we quantitatively assess the role of the various determinants in influencing the level (and sign) of the trade policy equivalent. Taken together, the framework should help focus on the extent to which single-desk STEs distort agricultural trade relative to the underlying benchmark. Section 4 summarises and concludes.

1. Establishing the Benchmark

In order to determine the trade distorting effects of an STE, the model can be constructed in one of two ways. First, it can be set up with the STE in place in the home country. The home country competes in the world market with a number of private foreign firms. Then the STE is replaced with a number of private home firms and the export subsidy equivalent derived, where the subsidy equivalent is the implicit tax/subsidy that would need to be given to private firms for them to achieve the same quantity of exports as the STE. The alternative approach is to set up the private-private benchmark first of all and then to measure the trade distorting effects of replacing the home private firms with a single STE through calculating the implicit subsidy (positive or negative) that the private firms would need to receive to have them export the same quantity as the STE. Although in the context of the anticipated international trade negotiations, the first approach would be more direct, the second is conceptually more straightforward and is the one that is used in the remainder of the paper.

The first step is to establish the benchmark. The approach builds on the models by Brander and Krugman (1983) and Thursby (1988). There are two exporting countries that compete on the world market. There are *n* home and *m* foreign private firms. These firms have to choose how much they sell in both their home markets as well as how much they export. Domestic and export markets are assumed to be segmented and hence domestic prices can differ from world prices. The products they sell are homogeneous and firms maximise profits and are assumed to play Cournot. In terms of their links with the agricultural sector, they face an upward sloping supply function and, therefore, they have some degree of oligopsony power with respect to the inputs they purchase. They have no other costs.

This scenario is the basis for the private-private benchmark that can be made more or less competitive by varying the number of *n* and *m* firms respectively[7]. It should be noted that in specifying this benchmark, it is also possible for the private firms to price discriminate; after all, the possibility of price discrimination is not

[7] Limiting the number of *m* private firms captures the common accusation that there are only a limited number of private (multinational) firms that compete on world grain markets. In the limit, as the number of firms increases, the Cournot outcome converges on the competitive outcome.

solely within the capability of a single-desk STE. In determining the trade policy equivalent measure of the STE, the current focus is on whether it is likely to be positive or negative and what factors are likely determine it, rather than regarding it as a measure for any particular STE in practice. In general form, the profit function for a representative home firm is given by:

$$\pi_i = d(y)y_i + D(x + X)x_i - p_s(y + x)(y_i + x_i) \quad (1)$$

where y_i is the level of its sales in the domestic market, x_i is the level of its sales to the export market, $d(y)$ is the inverse demand function for the domestic market (where $y = \sum_{i=1}^{n} y_i$), $D(x + X)$ is the inverse demand function on the world market (where $x = \sum_{i=1}^{n} x_i$, $X = \sum_{i=1}^{m} X_i$) and $p_s(y + x)$ is the inverse supply function of product from the agricultural sector.

For the foreign country, we assume the same set-up but denote the characterisation of the profit function by capitals, i.e.

$$\Pi_i = D(Y)Y_i + D(x + X)X_i - P_s(Y + X)(Y_i + X_i) \quad (2)$$

with the same interpretation as for the home country.

We proceed by solving the first-order conditions: $\partial\pi_i/\partial y_i$, $\partial\pi_i/\partial x_i$, $\partial\Pi_i/\partial Y_i$ and $\partial\Pi_i/\partial X_i$ and it is assumed that the second order conditions hold. Since we are looking to solve for an explicit value for the subsidy equivalent, we assume specific (linear) functional forms for the inverse demand and supply functions. Specifically, let $p = d(y) = a - by$, $P = D(Y) = A - BY$ and $p_w = a_w - b_w(x + X)$. The inverse supply functions are given by $p_s = f + k(y + x)$ and $P_s = F + K(Y + X)$ for the home and foreign country, respectively. For the home country, therefore, the first-order conditions give:

$$y_i = \frac{(a - f) - k(n+1)x_i}{(b + k)(n+1)} \quad (3)$$

$$x_i = \frac{(a_w - f + s^e) - b_w X - k(n+1)y_i}{(b_w + k)(n+1)} \quad (4)$$

where s^e is the subsidy equivalent that will be derived in the alternative characterisations of the market. Equations (3) and (4) can be used to solve x_i in terms of X:

$$x_i = \frac{(b+k)[(a_w - f + s^e) - b_w X] - k(a-f)}{(n+1)[(b_w + k)(b+k) - k^2]} \tag{5}$$

For the foreign country, we follow the exact same procedure, although since we will change only the home market specification, s^e is zero. The level of export sales (X_i) as a function of x is given by:

$$X_i = \frac{(B+K)[(a_w - F) - b_w x] - K(A-F)}{(m+1)[(B+K)(b_w + K) - K^2]} \tag{6}$$

Equations (5) and (6) can now be used to solve for explicit values of x and X, respectively. Aggregating over n and m firms respectively, yields aggregate quantities:

$$x = n\left\{\frac{\phi_1[(b+k)(a_w - f + s^e) - k(a-f)] - (b+k)mb_w[(B+K)(a_w - F) - K(A-F)]}{\phi_1\phi_2 - \beta b_w^{\,2}}\right\} \tag{7a}$$

$$X = m\left\{\frac{\phi_2[(B+K)(a_w - F) - k(A-F)] - (B+K)nb_w[(b+k)(a_w - f) - k(a-f)]}{\phi_1\phi_2 - \beta b_w^{\,2}}\right\} \tag{7b}$$

where $\beta = (b + k)(B + K)mn$

$\phi_1 = (m + 1)[(B + K)(b_w + K) - K^2]$

$\phi_2 = (n + 1)[(b + k)(b_w + k) - k^2.$

Equations (7a) and (7b) form the private-private benchmark which can be made more or less competitive by varying either n or m (or both) since as the number of firms increases, the Cournot outcome converges on the competitive outcome.

2. Models with a Single-Desk STE

Consider now the case of an STE in the home country. The STE replaces the n firms so that there is now a single-desk monopoly seller though it still competes in the world market with m firms from the foreign country. It is assumed that the payoff function for the STE is to maximise the joint returns (producer surplus) from selling in the home and export markets for the producers it represents. The change in market structure will change the quantities sold on the domestic and export markets. Since the quantities exported in the single-desk STE case may be greater (one would expect, given the likely focus of the WTO negotiations) than the private case, we can ask the

question, what would be the export subsidy that would have to be paid to the *n* private firms that would result in their exporting the same quantity, x^P, as exported by the STE, x^{STE}? In other words, we want to find the export subsidy that results in:

$$x^{STE} - x^P(s^e) = 0.$$

Clearly, the subsidy equivalent will depend on what the benchmark is, i.e. it will likely depend on the number of *n* and *m* firms. For example, if the number of *n* firms is large, the ability to price discriminate would be limited. If that market structure is replaced by a single-desk STE, it would be more effective in price discriminating. Therefore, in order to replicate the single-desk STE outcome, an implicit export subsidy would have to be paid to each of the *n* private firms. Note that, if the STE sold less than the private firms in the underlying benchmark, then the subsidy necessary to restore the identity given above would be negative, i.e. an export tax would be the equivalent instrument.

In introducing the STE, it is assumed that the foreign county retains its private firm set-up; the change in market structure occurs only in the home country. Moreover, it is assumed that this single desk STE maximises joint returns from sales in the domestic and export market as given by:

$$R = d(y)y + D(x + X)x - \int_0^{y+x} p_s(y+x)d(y+x) \qquad (1')$$

with the first order condition giving:

$$y = \frac{a - f - kx}{(2b + k)} \qquad (3')$$

$$x = \frac{a_w - f - b_w X - ky}{(2b_w + k)} \qquad (4')$$

Substituting equation (3') into equation (4') we can write *x* as a function of *X* only:

$$x = \frac{(2b + k)(a_w - f) - (2b + k)b_w X - k(a - f)}{(2b_w + k)(2b + k) - k^2} \qquad (5')$$

Equation (5') can now be used with equation (6) to solve for the level of export sales of the STE and is given by:

$$x = \frac{\phi_1\alpha_1 - \alpha_3}{\phi_1\alpha_2 - m(2b + k)(B + K){b_w}^2} \qquad (7')$$

where $\alpha_1 = (2b + k)(a_w - f) - k(a - f)$

$\alpha_2 = (2b_w + k)(2b + k) - k^2$

$$\alpha_3 = m(2b + k)b_w\{(B + K)(a_w - F) - K(A - F)\}.$$

To recall, we defined the subsidy equivalent as the subsidy that would have to be paid to the private firm to replicate the STE outcome. This is done by setting (7a) equal to (7') and solving for s^e. This gives:

$$s^e = \frac{1}{n\phi_1(b+k)}\left[\frac{\phi_1\phi_2 - \beta b_w^{\,2}}{\phi_1\alpha_2 - m(2b+k)(B+K)b_w^{\,2}}(\alpha_1\phi_1 - \alpha_3) - \varepsilon_1 + \varepsilon_2\right] \qquad (8)$$

where $\varepsilon_1 = n\phi_1[(b + k)(a_w - f) - k(a - f)]$

$$\varepsilon_2 = mn(b + k)b_w[(B + K)(a_w - F) - K(A - F)]$$

with ϕ_1, ϕ_2, α_1, α_3 and β being defined as above.

If equation (8) is greater than zero, then a subsidy would have to be paid to the private firms to replicate the STE outcome. Equation (8), therefore, is a measure of the trade distorting impact of the STE on world markets. This would be indicative of the single-desk STE exporting a relatively greater amount than would be expected from the private-private benchmark. Similarly, if equation (8) is negative, the trade distorting impact of the STE would be equivalent to an export tax.

3. Measuring the Subsidy (Tax) Equivalent Distortions

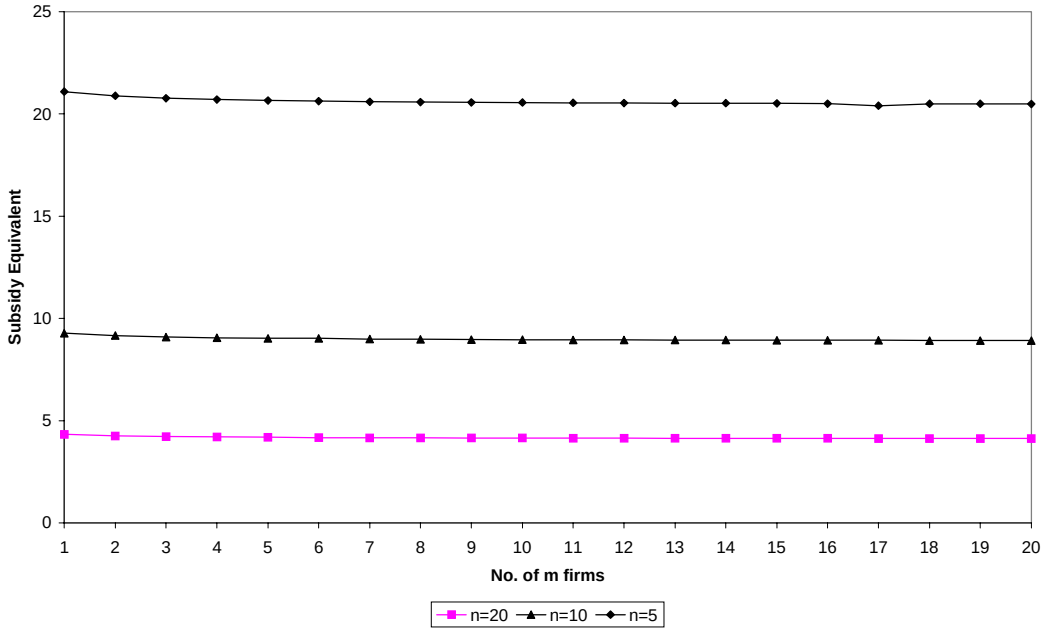
Since we have assumed linear functional forms, we can calculate the subsidy equivalent outcomes for given parameter values. The chosen values for the calibrated example are meant only to capture specific characteristics of the world market rather than being calibrated to real world data. Although varying the underlying calibration data can affect the value of the trade distorting equivalent measures, as is shown below, they do not affect the ranking between the various scenarios which is the focus of this paper.

Consider the effects of the STE relative to private-private benchmarks. Assume initially that domestic demand is less price elastic than export demand ($e_D < e_W$), that domestic sales (y) exceed exports (x) and that the domestic price exceeds the world price. Agricultural producers receive a weighted average of the domestic and world price.

Focus first of all on the revenue maximising single-desk STE with the subsidy equivalent calculation being given by equation (8). As one would expect, this subsidy equivalent policy would depend on what the benchmark was in the first place and will

depend on both *n* and *m*, respectively the number of domestic and foreign private firms in the underlying benchmark. Consider Figure 1a. In this case the subsidy equivalent has been calculated for varying numbers of *n* and *m* private firms where the subsidy equivalent measure is expressed as the subsidy per firm. The subsidy

Figure 1a: Subsidy Equivalent of a Single STE
($e_D < e_W$, $y > x$)



equivalent measure is given on the vertical axis with the number of foreign firms being represented on the horizontal axis. Three cases are considered: $n = 20$, $n = 10$ and $n = 5$. In the $n = 20$ and $n = 10$ cases, the home market in the private-private set-up was, to varying degrees, relatively competitive.

In the $n = 5$ case, the private market is characterised by a small-number private sector oligopoly. As is shown in the Figure, the subsidy equivalent distortion is positive for all three cases. In other words, the single-desk STE distorts export markets by selling relatively more than the private benchmark would predict. Note however that the size of the subsidy equivalent measure is influenced more by the number of domestic firms (*n*) than by the number of foreign firms (*m*). For the case of $n = 5$, replacing an STE by a small-number private sector oligopoly would have a considerable effect on world markets as the private sector oligopoly would also exercise market power on both domestic and international markets. However, the private sector oligopoly would export relatively less than the STE to the world

market. This result shows that the presence of the single-desk STE can have a potentially considerable impact on world markets relative to a small-number private firm oligopoly. However, if the domestic market was initially competitive (n = 10 or 20), the STE would not make a significant difference as the (large number of) private firms do not have much market power and hence cannot so effectively price discriminate. Although the single-desk STE does price discriminate, given that it acts more competitively than a private sector monopoly, the impact of the STE is more similar to a competitive benchmark. This outcome is consistent with the regulation literature with 'mixed oligopoly'.[8] Since the public firm has an objective other than that of maximising profit, the resulting equilibrium is more competitive compared to the private oligopoly case.

However, as far as competing exporters are concerned, they nevertheless lose market share to the single-desk STE exporter country. In terms of the consequences of de-regulating the single-desk STE, if privatisation would lead to replacing the public monopoly with a large number of private firms, there would not necessarily be much impact on world trade.

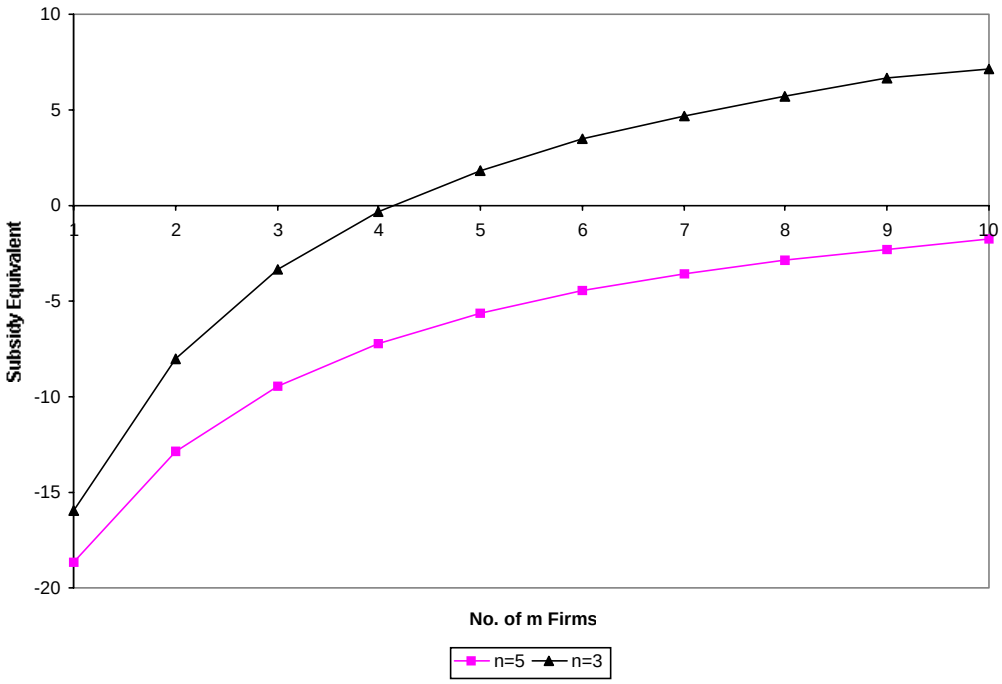
An alternative explanation for the results in Figure 1a is that the ability to distort export markets arises through the ability to also influence sales on the domestic market. Since the world demand function is more elastic than the domestic demand function and, given the assumption that markets can be segmented, the private firms and the single-desk STE limit domestic sales and 'dump' exports on the world market. With n large, the ability to behave thus is slim but with n small, the ability to this is considerably greater. However, given the nature of the single-desk STE objective function, this leads to a higher level of output which tends towards levels consistent with the competitive (private) benchmark.

To determine whether the results shown in Figure 1a are sensitive to the values of the elasticities chosen, they were set equal to each other (in the previous example the world demand elasticity was assumed to be relatively elastic). The outcome is shown in Figure 1b for values of n of 3 and 5. It appears now that the number of foreign firms makes a considerable difference to the trade effects of the STE. When the number of domestic firms is small (n = 3) and the number of foreign firms is also small (m < 4), the STE distorts trade by exporting too little relative to the

[8] See, for example, de Fraja and Delbono (1990) for an overview of the mixed oligopoly literature.

private oligopoly, the export subsidy equivalent being an implicit export tax. However, if $m > 4$, then the STE again exports more than would a private oligopoly. It is also obvious from Figure 1b that the value of m at which the subsidy equivalent switches from being an implicit tax to an implicit subsidy is also sensitive to the number of domestic firms. For example, when $n = 5$, the subsidy equivalent remains an implicit export tax for all $m < 10$. Hence, it may be concluded that the effects of the number of foreign firms depends upon the values chosen for the relative elasticities of demand.

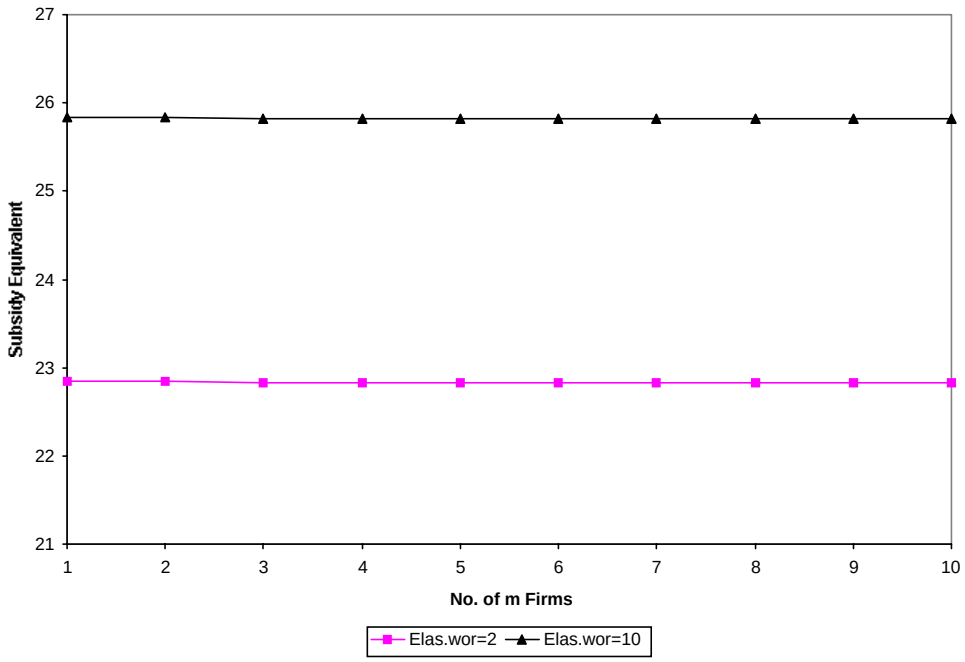
Figure 1b: Subsidy Equivalent of a Single STE
($e_D = e_W$, $y > x$)



Consider now the relative importance of the domestic market to the STE (in the previous examples it was assumed that the domestic market accounted for a majority of total sales). Suppose in this case that the proportion of domestic production sold at home and exported is 50:50. Assume, as previously, that domestic demand is less price elastic than export demand. The effects of alternative values of the export demand elasticity for the size of the subsidy equivalent are shown in Figure 1c for $n = 5$ and several values of m. As before, the size of m has almost no effect on the size of the subsidy equivalent. But, if the two elasticities are now made equal and the domestic and export shares remain at 50:50, then the value of m has a considerable

effect (Figure 1d). For small values of m ($m < 4$) and $n = 4$, the STE exports less than would the 4-firm private oligopoly but for $m > 4$, the STE would export more.

Figure 1c: Subsidy Equivalent of a Single STE
($e_D < e_W$, $y = x$)

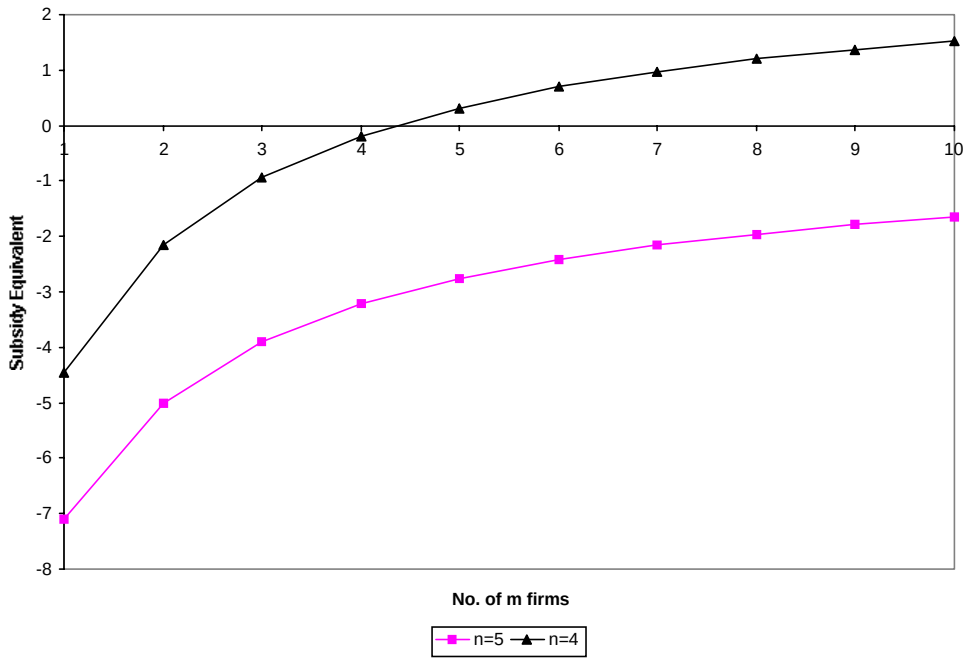


However, if the benchmark were a 5-firm oligopoly, the STE would remain exporting less than the private oligopoly for values of m up to at least 10. The switching in the nature of the implicit instrument that occurs when $n = 4$ is similar to that found in the strategic trade literature in which the optimal strategic policy switches from an export subsidy to an export tax as the number of domestic firms increases.

In sum, STEs can impact upon world trade as the trade distorting equivalent measure (the implicit subsidy or tax effect) of the STE can be positive or negative. The factors that determine its sign and size depends on the number of domestic firms, the relative values of the domestic demand and world demand elasticities, the relative importance of the domestic relative to the foreign market and the number of foreign firms. Moreover, under some circumstances the implicit subsidy can be negative if the number of foreign firms is sufficiently small coupled with the export market being relatively similar to the domestic market in terms of is relative importance in total sales and the relative values of the demand elasticities. In other words, under some circumstances, the STE may export less than what would be expected from the private: private benchmark. In most cases, however, the subsidy equivalent effect is

positive as long as the number of competing foreign firms is not too small. In these cases, the STE exports too much relative to the private: private benchmark.

Figure 1d: Subsidy Equivalent of a Single STE
($e_D = e_W$, $y = x$)



4. Summary and Conclusions

In this paper we have set out to develop a framework for measuring the trade distorting effects of single-desk STEs when markets are potentially imperfectly competitive. The central idea was to develop a flexible benchmark case against which the trade distorting effect of the single-desk STE outcome can be compared. The key device we used was to calculate the export subsidy equivalent that would be necessary to pay (or export tax that would be implicitly imposed on) to the private firms for them to replicate the level of exports that would arise in various scenarios in which we characterise a single-desk STE.

It was shown that comparing a single-desk STE with a private-private benchmark would imply that the export subsidy equivalent is positive, i.e. single-desk STEs do distort world markets by exporting 'too much'. However, the size of the export subsidy equivalent depends crucially on the underlying benchmark, in other words, how competitive would be the home country market in the absence of the single-desk STE. The extent of competition on world markets also matters when the

relative importance of the world market (relative to the domestic market) increases and/or when demand elasticities are relatively similar.

In sum, it has been shown in this paper that single-desk STEs may distort trade but the direction and extent to which they do so depends on the characterisation of the benchmark.[9] Given the insights in this paper regarding how single-desk STEs can potentially distort trade, future research will be based on calibrating the framework to 'real world' cases to identify how significant the trade distorting effects are likely to be in practice. Moreover, extending the coverage to the importing country case is an obvious parallel to the exporting country case covered here and is the focus of current research.

References

Brander, J.A. and Krugman P. 1983, 'A Reciprocal Dumping Model of International trade', *Journal of International Economics*, vol. 15, pp. 313-323.

Carter, C.A. and Loyns R.M.A. 1998, 'The Canadian Wheat Board: Its Role in North American Trading', Mimeo, University of California, Davis.

Carter, C.A., Loyns, R.M.A. and Berwald, D. 1998, 'Domestic Costs of Statutory Marketing Boards: The Case of the Canadian Wheat Board', *American Journal of Agricultural Economics*, vol. 80, pp. 313-324.

De Fraja, G. and Delbono, F. 1990, 'Game Theoretic Models of Mixed Oligopoly', *Journal of Economic Surveys*, vol. 4, pp. 1-17.

Dixit, P. and Josling, T. 1997, 'State Trading in Agriculture: An Analytical Framework', International Agriculture Research Consortium Working Paper #97-4.

Kolstad, C.D. and Burris A.E. 1986, 'Imperfectly Competitive Equilibria in International Commodity Markets', *American Journal of Agricultural Economics*, vol. 68, pp. 27-36.

Laffont, J-J. and Tirole, J. 1993, *A Theory of Incentives in Procurement and Regulation*, MIT Press, Cambridge.

Lloyd, P. 1982, 'State Trading and the Theory of International Trade' in Kostecki, M.M. (ed.), *State Trading in International Markets*, Macmillan Press, London.

McCalla, A.F. 1966, 'A Duopoly Model of World Wheat Pricing', *American Journal of Agricultural Economics*, vol. 48, p. 711-727.

Meade, J.E. 1955, *Trade and Welfare. Volume II*. Oxford University Press, Oxford.

[9] As shown in our longer paper, the distortion also depends upon the existence of government support policies directly targeted at the agricultural sector, the relative inefficiency of the STE compared to the private firms, and the form that the STE takes.

Murphy, S. 1999, 'Market Power in Agricultural Markets: Some Issues for Developing Countries', *Trade-Related Agenda, Development and Equity*, Working Papers 6, South Centre.

Pal, D. and White, M. 1998, 'Mixed Oligopoly, Privatisation and Strategic Trade Policy', *Southern Economic Journal*, vol. 65, pp. 264-281.

Patterson, P.M. and Abbott, P.C. 1994, 'Further Evidence on Competition in the US Grain Trade', *Journal of Industrial Economics*, vol. XLII, pp. 429-437.

Thursby, M. 1988, 'Strategic Models, Market Structure and State Trading', in Baldwin R. (ed.), *Trade Policy Issues and Empirical Analysis*, University of Chicago Press, Chicago.

Watson, A.S. 1999, 'Grain Marketing and National Competition Policy: Reform or Reaction?', *Australian Journal of Agricultural Economics*, vol. 43, pp. 429-455.

USDA (2000) 'Proposal for Comprehensive Long-Term Agricultural Trade Reform', http://www.fas.usda.gov/itp/wto/WTO-062300.html.

WTO 1995, *The Results of the Uruguay Round of Multilateral Trade Negotiations: The Legal Texts*, Geneva.