Economies of scale and endogenous market structures in international grain trade

Margherita Scoppola[1]

Dipartimento di Studi sullo Sviluppo Economico
University of Macerata
Piazza Oberdan 3, 62100 Macerata (Italy)
scoppola@unimc.it

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1. Introduction

A large body of literature has examined international grain trade in imperfectly competitive models by using different analytical settings[2]. This paper develops a model that differs from previous ones, since it specifically takes into account export strategies used by multinational firms and considers their ability to exploit economies of scale.

Even though the issue concerning the degree of competition on the international grain market is still controversial[3], it is a matter of fact that during the past fifty years the grain trading industry in important exporting countries, like the US and the EU, has been highly concentrated. In fact, a small number of multinational exporting firms account for a large share of the international market and in this industry there have been few exits and almost no newcomers[4]. This market structure may be explained with the presence of scale economies which prevent newcomers from entering the industry. In an early contribution, Caves (1977) has stressed the relevance of two kinds of scale economies in the international grain trading industry: *intangible* and *tangible* scale economies; the former arise from the need for the firm to acquire information which is essential for the grain trading industry but requires high fixed costs, and acts as a barrier to enter this industry; the latter arise from the acquisition of facilities for grain storage, handling and transportation, which also require high initial costs. More recent studies confirm the relevance of these tangible economies of scale (e.g. Wilson, Dahl, 1999). Nowadays, large grain trading firms mainly do *direct* exports, i.e. they maintain

[2] Due to the severe space constraints, it is not possible to include an exhaustive list of references on this topic. Contributions which deal more specifically with the issues addressed in this paper in an oligopolistic framework include Thursby (1988), Hamilton, Stiegert (2002), McCorriston, MacLaren (2005).

[3] Relevant contributions on this issue are, among others, Caves, Pugel (1982), Patterson, Abbott (1994).

[4] Scoppola (1995) estimates the multinationals share of grain exports in the eighties to be the 70% in the US and the 90% in the EU. Kneen (2002) reports that in 1997 Cargill was exporting the 25% of US grain exports. Wilson, Dahl (1999) estimate the share of Continental Grain (which was acquired in 1998 by Cargill) to be the 20% of US grain exports.

a direct control over all exporting /importing functions using their own facilities even in the importing countries. In this paper this marketing strategy, which requires initial fixed costs, is assumed to be chosen by private firms in order to avoid the transaction costs arising from negotiating with downstream operators. The explanation of direct exports, thus, is based on the hypothesis of incompleteness of contracts in the international transactions, initially developed in the literature on multinational firms (Caves, 1996) and more recently in the international trade theories (Spencer, 2005).

On the other hand, exports from two important grain exporters, Canada and Australia, are managed by a state trading enterprise (hereinafter "STE"); several papers have emphasized the distinctive nature of the STEs with respect to the private firms, mainly concentrating on their peculiar objective function (e.g. Carter *et al*., 1998; McCorriston, MacLaren, 2005).

In this paper the focus is on the different exporting strategies used by the two firms: while the multinational firm may choose *direct* export, the STE is assumed to export only *indirectly* as it operates as a "pure middlemen", that is, it allows other firms to perform most of the international marketing functions and, thus, does not incur in fixed costs generating tangible economies of scale. This means that if transaction costs in international trade are very high, the multinational has a competitive advantage with respect to the STE, since it can exploit the economies of scale and skip transaction costs. These features have been included in a two-stage duopoly model.

A further distinctive feature of the model presented in this paper is that market structure is endogenous, that is, it is the outcome of the first stage of the game: the multinational firm chooses its export strategy according to the relative values of transaction and fixed costs; the resulting market structure may thus differ not only, as usual, because of the number of firms, but also because of the different export policies followed by the multinational firm.

The analytical framework is based on a partial equilibrium model of international trade which includes multinational firms developed by Horstmann, Markusen (1992) and Markusen (2002). However, the setting is substantially different, since it considers specific features of the international grain trade[5]. The results of the game are examined by using numerical examples. First, simulations have been carried out by assuming that the two firms face the same domestic costs; then, it has been assumed that the domestic costs differ in order to study STE's potential competitive (dis)advantages. The results show that external shocks on export markets may cause different effects on trade compared to those predicted by models which do not take economies of scale into consideration and take for granted that private traders export only indirectly.

On the whole, the analytical framework developed herein has some interesting policy implications for the ongoing WTO negotiations in the DDA round on the possible effects of regulating STEs. The model developed in this paper shows that a reduction of the subsidy to the exporting STE may result in a replacement of the STE by the multinational, even though the final market structure crucially depends upon the initial market structure. Further, the paper also emphasizes that a liberalization of an importing STE may largely affect market structure and, accordingly, the market shares of the exporting countries.

2. The model

This model considers two exporting countries (*i* and *j*) and one importing country (*z*) of a homogeneous agricultural product. Exports from country *i* are managed by a multinational firm, while a STE has the exclusive right to purchase and export from country *j*; both firms sell on their own domestic market, export to country *z* , and to the other firm's market[6]. Let p_i,

[5] In the model developed by Horstmann, Markusen (1992) and Markusen (2002) there are two countries and two-ways flows of trade and investments; this paper considers three countries, and between the exporters and the importer there are one-way flows. Further, in this paper only one firm may invest abroad and exploit economies of scale.

[6] This setting is aimed at representing some of the key features of competition among two of the most important grain exporters, i.e. the USA and Canada: exports are carried out by a few multinational firms and a STE, which

p_j and p_z be the inverse demand curve; we assume linear functional forms and identical demand in the two exporting countries: $p_i = \alpha - \beta(XM_i + XS_i)$, $p_j = \alpha - \beta(XM_j + XS_j)$ and $p_z = \lambda - \delta(XM_z + XS_z)$ with *XM* and *XS* being exports/sales, respectively, of the multinational firm and of the STE.

The multinational firm may export to *z* indirectly or directly: in the first case, the multinational firm faces transaction costs t_z, while in the second case it faces initial fixed costs D_z, but does not face transaction costs. The multinational firm, thus, chooses direct (indirect) exports if transaction costs (fixed cost) are high relative to fixed costs (transaction costs). Both firms purchase and export only domestic agricultural products, sustaining marginal costs (c_i and c_j), which are assumed to be constant[7], and sell part of the products on the domestic market. These also bear firm-specific fixed costs, (H_m and H_s) which include the cost of acquiring intangible assets which are joint inputs in trading across all markets. Firm-specific fixed costs *H* are assumed to be high relative to demand, thus markets can support, at the most, one or two firms; further, the said costs are considered to be faced by firms on the domestic market. Markets are assumed to be segmented, so that firms can price independently in the three markets[8]. The firms play a two-stage game. In the first stage, firms choose the entry strategy. Moves in the first stage of the game are assumed to be simultaneous. In the second stage, the firms play a Cournot game. The game is solved backwards, by first considering the second stage decision.

The profit M_z of the multinational firm in the market *z*, when it chooses *indirect* exports is:

$$M_z = \left[\lambda - \delta(XM_z + XS_z)\right]XM_z - (c_i + t_z)XM_z \qquad (1)$$

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are often rivals on the same export market; albeit limited, there is also some trade between the two exporting countries. Production of country *z* is assumed to be zero.

[7] The assumption of constant marginal costs, routinely used in the new trade theory models, is obviously simplistic; the model also ignores the trade effects of STEs, due to the producer payment system, pooling and cross-subsidisation. However, this seems to be less relevant for this paper which focuses on the trade effects of different market structures, rather than on the effects of input pricing strategies, although the latter may affect the competitive position of the STE.

[8] Evidence of price discrimination practices by the Canadian Wheat Board has been provided, among others, by Brooks, Schmitz, (1999).

The STE is assumed to maximize the producers' welfare S_z:

$$S_z = [\lambda - \delta(XM_z + XS_z)]XS_z - \int c_j dXS_z - t_z XS_z \qquad (2)$$

If the multinational *exports directly* to *z* the profit equation is:

$$M_{zd} = [\lambda - \delta(XM_{zd} + XS_{zd})]XM_{zd} - c_i XM_{zd} - D_z \qquad (3)$$

Table 1 reports the equilibrium profits in the second stage of the game for all market structures[9]. The payoff to the multinational firm (STE) in each outcome of the game is obtained by adding up the equilibrium profits on the three markets, corresponding to the outcome of the game (Table 2)[10].

3. Trade and market structures with cost symmetry

The results for this model are illustrated by using numerical examples; the choice of the values of the parameter is aimed at reproducing some of the key features of the international grain trade[11]. The main assumptions are the following.

Firstly, country *z* is larger than countries *i* and *j*; this assumption is consistent with the limited size of the US and Canadian grain markets, with respect to the export markets. Secondly, the firm-specific fixed cost *H* is high enough to make profits negative in some market structures; for example, it is assumed that grain trading is not profitable if limited to the domestic market and to the rival's market. Thirdly, simulations are based on a cost symmetry hypothesis, i.e. it is assumed that the two firms face the same firm-specific fixed costs and the same marginal and transaction costs.

[9] By assuming that the multinational (STE) does export/sell to/in one or more markets, all profits and exports in duopoly and monopoly can be easily obtained. Derivation merely involves computation of Cournot equilibria under different market structures.

[10] Some actions have been excluded from the first stage of the game: i) the STE exports to *i* and/or to *z* without selling on the domestic market; ii) the multinational exports to *j* and/or to *z* without selling on the domestic market. Given the assumptions of the model, the dimension of the pay-off matrix is 7*5.

[11] Obviously, the choice of the values of the parameters may affect the magnitude of the trade effects and also the "point" at which market structure may change; however, they do not influence the *direction* of the changes.

The only difference between the two firms, therefore, is their export strategy; if transaction costs in country *z* are high, the multinational firm has an advantage since it can exploit the economies of scale and skip transaction costs.

Consider how the Nash equilibrium is affected by different values of costs in market *z*: if t_z is large relative to D_z, then the optimal choice of the multinational firm, whatever the choice of the STE, is to export directly to market *z*; the greater t_z is, the larger is STE's disadvantage. If transaction costs become very high, STE's profits become negative and the optimal choice of the STE is the no entry option. On the other hand, if D_z is high enough, the multinational firm opts for indirect exportation and the STE enters because its profits become positive[12].

Figure 1 shows the resulting Nash equilibrium regimes as a function of D_z and t_z. In area 1 the equilibrium market structure is a duopoly, with both firms exporting indirectly[13]. Area 2 denotes again a duopoly, but the multinational opts for direct exports. Finally, in area 3 the multinational firm is a monopolist and exports directly. Table 3 reports the changes in total exports, market shares and prices, when transaction and fixed costs change[14].

When both D_z and t_z are zero, there is a multiple Nash equilibrium and regimes 1 and 2 are equivalent. The two firms operate in a completely symmetrical framework and, as expected, they have an equal market share. This situation is used as a benchmark to evaluate the effects that a change in the two variables has on trade.

Now consider the effect of an increase of t_z. If fixed costs are relatively low, then the multinational firm opts for direct exports and regime 2 prevails. This implies a reduction in the exported volumes and a change in market shares: the multinational firm gains, while the

[12] The chosen parameter values have produced an asymmetric set of market structures, as under certain conditions the STE optimal choice is not to enter, but this does not happen for the multinational. Obviously, it is sufficient to change the hypothesis underlying the simulations to revert the outcome: for example, if we assume that the multinational faces fixed cost H_m higher than those faced by the STE H_s, then the Nash equilibrium regimes also include a monopoly of the STE.

[13] In figure 1, the values of the other parameters are the following: α=30; β=1; λ=60; δ=1; H_m=H_s=200; c_i =1; cj=1; t_i= t_j =7.

[14] Exports, market shares and prices in countries *i* and *j* are not reported due to the space constraint; given the simulation assumptions, market shares and total exports are rather stable across all D_z and t_z values, with the only exception of region 3, where the multinational accounts for the entire *i* and *j* markets.

STE loses. If transaction costs become high enough, the STE chooses not to enter the market (region 3); in this case, the collapse of the regime into a multinational monopoly implies an overall fall of the quantities being exported and an increase in prices.

On the other hand, if transaction costs are relatively low but above zero, an increase in the fixed costs may result in a change of the multinational firm's exporting strategy from direct (region 2) to indirect exportation (region 1). This implies a reduction of the overall exported volumes and a decrease in the multinational's market share (Table 3).

An interesting insight from Figure 1 is that starting from a point on the right side of area 1 (a "symmetric" duopoly), everything else held constant, a decrease in the fixed costs may shift the market structure to region 3. This happens because by shifting to direct exports, the multinational firm reduces variable costs and increases exports; as a consequence, STE's exports decrease and, given the high values of transaction costs, profits become negative. This result is also clear when comparing STE's exports and profits under region 1 market structure with those of region 2 (Table 1).

These results may have some interesting implications. Under the assumptions made, structural changes in foreign markets may have different effects from those predicted when economies of scale are ignored, and it is taken for granted that both the STE and the multinational firm enter the foreign market by means of indirect exportation. The consequences of assuming exogenous market structures in terms of predictable trade effects may be relevant: an increase of t_z would result in an overall decrease of exports, leaving market shares unchanged (the shift is toward the right-hand side of Figure 1, but always remaining within the same region 1). On the contrary, with economies of scale and endogenous market structures, the external shock produces a change in market structure leading to significant changes in market shares. In addition, in a model disregarding economies of scale and direct exports, a change in the fixed

costs would have no trade effects; whereas, if the option of direct exports is also taken into account, there would be significant changes in the market structure, exports and market shares. A further implication is that the effects of an external shock on trade depend on the starting condition. As already mentioned, if the starting regime is placed in the lower part of region 1, an increase in transaction costs changes the market structure, but this does not occur if the initial point is in the upper part of region 1. This means that, before evaluating the effects of a shock on trade, the initial regime should be known and its implications considered.

4. Trade and market structures with domestic cost asymmetries

In a second set of simulations, cost asymmetry has been considered by assuming that $c_j \neq c_i$. This hypothesis is aimed at taking into account, on one hand, the potential inefficiencies of the STE, which have been underlined by some authors (e.g. Carter, Loyns, Berwald, 1998) ($c_j > c_i$.) and, on the other hand, the competitive advantage of STE due, for example, to the various benefits granted by its government, and in this case $c_j < c_i$, . The objective here is twofold: to check whether the assumption of domestic cost symmetry influences the results; and to analyze the effect of a change of the STE competitive (dis)advantages.

Figure 2 shows the Nash equilibrium regimes as a function of (c_j-c_i) and t_z. The benchmark here is c_j-c_i = 0 and t_z=0, i.e. the symmetry case already examined above. In that case, if t_z is relatively low, region 1 market structure prevails, while for t_z >20 there is a shift toward a duopoly with direct exports (region 2) which collapses into a monopoly when t_z> 25. If the multinational firm has a significant cost advantage with respect to the STE (c_j-c_i = 2), then an increase of t_z would shift market structure directly from region 1 to region 3, that is, to a monopoly of the multinational firm. Finally, if the STE has a competitive advantage with respect to the multinational (c_j-c_i = -1), then even a large increase in the transaction costs would not lead to a monopoly. The trade effects of these changes are reported in Table 4.

It should be noted that, in all scenarios with asymmetric costs, even if t_z=0, the two firms' market shares differ because of their different competitive position. Overall, trade effects are qualitatively similar across all values of c_j-c_i: an increase of t_z yields a reduction of exports and a change of market shares (a decrease of the STE's share and an increase in that of the multinational). Thus, the main difference between the asymmetric and symmetric cases is the "point" at which there is a change in the market structure: the higher the cost gap c_j-c_i, the lower the level of transaction costs causing a shift towards a monopoly by the multinational firm.

A second issue is related to the impact of an increase in the cost gap c_j-c_i due, for example, to a reduction in the support given to the STE by its government. If transaction costs are low relative to fixed costs and the initial regime is placed in region 1, market structure does not change. However, if transaction costs are high (i.e. the initial regime is placed in region 2), an increase of the STE costs may result in a monopoly of the multinational firm. Again, the impact of any policy change on trade crucially depends upon the initial regime.

5. Conclusions and policy implications

This paper has developed a model of international grain trade by assuming imperfect competititon, economies of scale and endogenous market structures. The hypotheses of the model are aimed at capturing some of the basic features of the international grain trading industry: few multinational exporting firms compete with STEs; intangible economies of scale act as barriers to entering the industry; multinational firms may choose among two exporting strategies, i.e. direct *versus* indirect exportation. The main distinctive feature of the model, with respect to most international trade model for agricultural products, is the fact that it takes in consideration direct exportation as a specific practice used by the multinationals to avoid transaction costs.

The numerical examples have shown how the model may lead to predictions which differ from those reached by models which do not consider economies of scale. More specifically, the main findings are the following:

a) economic and policy changes in foreign markets affecting the relative values of transaction and fixed costs of the international grain trading, may result in a change of market structures and, consequently, of market shares;

b) the effects of an external shock on trade depend on the initial market structure. This means that before evaluating the effects of a shock on trade one should determine the initial regime.

c) the assumption that there is a gap between firms' domestic costs does not significantly change the outcome of the game, even though it may affect the "point" (i.e. the relative values of transaction and fixed costs) at which the market structure changes.

d) the effect of a worsening of the STE's competitive position, in relation to that of the multinational, depends again on the starting market structure.

These results may have relevant policy implications for the current negotiation within the WTO DDA round on disciplinating STEs. One of the main concerns about regulating exporting STEs is dealing with the possible replacement of the STE by the private multinational firms, which may not ensure an increase in competition and a move towards free trade (e.g. Fulton, Larue, Veeman, 2001, Young, 2005, Furtan, 2005). This model shows how, if the competitive position of the STE is worsened because, for example, the support it receives from its government is reduced, a multinational monopoly could be established. However, this may happen only if the multinational firm already exports directly (the starting regime is placed in region 2 of Figure 2), while it cannot occur if transaction costs are low relative to fixed costs (the initial equilibrium is placed in region 1).

Therefore, the first implication of the model is that, the impact a reduction of implicit subsidies to the STE has on trade may also depend on the transaction and fixed costs incurred

by firms on foreign markets: if the former are relatively low, then a reduction of the subsidies to the STE only leads to a reduction of its market share; however, if transaction costs are high relative to fixed costs, a reduction of subsidies to the STE may cause the replacement of the STE on the foreign market by the multinational.

Secondly, this model can also give an insight into the effects of policy changes in the importing countries. Privatisation of importing functions can make the option of direct exportation more profitable for the multinational. The replacement of a state agency with several private importers may imply an increase of purchase specifications and a reduction of the average size of transactions, leading to a substantial increase in transaction costs (Wilson, Dahl, 1999). On the other hand, the removal of legislative restrictions to investments by foreign companies results in reducing fixed costs linked with direct exports. These changes make the option of direct export more profitable for the multinational which may increase its market shares at the expenses of the exporting STE. The second implication of the model, thus, is that the elimination of an importing STE may result in an increase of the market share of countries whose exports are managed by multinational firms.

The third implication is that for countries whose exports are managed by a single-desk STE, the elimination of subsidies to exporting STEs may be a more convenient outcome of WTO negotiations than a full liberalization of importing STEs. Let us assume that before liberalization there is a region 1 regime (i.e. a duopoly with indirect exports): a reduction of subsidies to the exporting STE leaves unchanged the market structure and, accordingly, the STE loses market share, but it is not forced out from the market by the multinational firm. However if, everything else held constant, the importing STE is eliminated, the market structure may move towards regions 2 or 3, that is, it may collapse in a multinational firm monopoly.

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Table 1: Profits under different market structures

	Market structures	Multinational firm	STE
Market i	**Duopoly**	$M_{ii} = \beta\left[\frac{(\alpha - 2c_i + c_j + t_i)}{3\beta}\right]^2 - H_m$	$S_{ii} = \beta\left[\frac{\alpha + c_i - 2c_j - 2t_i}{3\beta}\right]^2$
	Monopoly	$M_{i0} = \beta\left[\frac{(\alpha - c_i)}{2\beta}\right]^2 - H_m$	$S_{0i} = \beta\left[\frac{\alpha - c_j - t_i}{2\beta}\right]^2$
Market j	**Duopoly**	$M_{jj} = \beta\left[\frac{(\alpha - 2c_i - 2tj + c_j)}{3\beta}\right]^2$	$S_{jj} = \beta\left[(\frac{\alpha + ci + tj - 2cj}{3\beta}\right]^2 - H_s$
	Monopoly	$M_{j0} = \beta\left[\frac{(\alpha - c_i - tj)}{2\beta}\right]^2$	$S_{0j} = \beta\left[(\frac{\alpha - cj)}{2\beta}\right]^2 - H_m$
Market z	**Duopoly with indirect exports**	$M_{zz} = \delta\left[\frac{(\lambda - 2c_i - 2t_z + c_j + t_z)}{3\delta}\right]^2$	$S_{zz} = \delta\left[\frac{\lambda + c_i + t_z - 2c_j - 2t_z}{3\delta}\right]^2$
	Duopoly with direct exports	$M_{zd} = \delta\left[\frac{(\lambda - 2c_i + c_j + t_z)}{3\delta}\right]^2 - D_z$	$S_{zd} = \delta\left[\frac{\lambda + c_i - 2c_j - 2t_z}{3\delta}\right]^2$
	Monopoly with indirect exports	$M_{z0} = \delta\left[\frac{\lambda - c_i - t_z}{2\delta}\right]^2$	$S_{0z} = \delta\left[\frac{\lambda - c_j - t_z}{2\delta}\right]^2$
	Monopoly with direct exports	$M_{zd0} = \delta\left[\frac{\lambda - c_i}{2\delta}\right]^2 - D_z$	

Table 2: The pay-off matrix

		STE				
		{i, j, 0}	**{i, j, z}**	**{0, j, z}**	**{0, j, 0}**	**{0, 0, 0}**
Multinational firm	**{i, j, 0}**	$M_{ii}+M_{jj}, S_{jj}+S_{ii}$	$M_{ii}+M_{jj}, S_{jj}+S_{ii}+S_{oz}$	$M_{i0}+M_{jj}, S_{jj}+S_{oz}$	$M_{i0}+M_{jj}, S_{jj}$	$M_{i0}+M_{j0}, 0$
	{i, j, z}	$M_{ii}+M_{jj}+M_{z0}, S_{jj}+S_{ii}$	$M_{ii}+M_{jj}+M_{zz}, S_{jj}+S_{ii}+S_{zz}$	$M_{i0}+M_{jj}+M_{zz}, S_{jj}+S_{zz}$	$M_{i0}+M_{jj}+M_{z0}, S_{jj}$	$M_{i0}+M_{j0}+M_{z0}, 0$
	{i, 0, z}	$M_{ii}+M_{z0}, S_{0j}+S_{ii}$	$M_{ii}+M_{zz}, S_{0j}+S_{ii}+S_{zz}$	$M_{i0}+M_{zz}, S_{0j}+S_{zz}$	$M_{i0}+M_{z0}, S_{0j}$	$M_{i0}+M_{z0}, 0$
	{i, 0, 0}	$M_{ii}, S_{ii}+S_{0j}$	$M_{ii}, S_{ii}+S_{0j}+S_{0z}$	$M_{i0}, S_{0j}+S_{0z}$	M_{i0}, S_{0j}	$M_{i0}, 0$
	{0, 0, 0}	$0, S_{0j}+S_{0i}$	$0, S_{0j}+S_{0i}+S_{0z}$	$0, S_{0j}+S_{0z}$	$0, S_{0j}$	$0, 0$
	{i, j, zd}	$M_{ii}+M_{jj}+M_{zd0}, S_{jj}+S_{ii}$	$M_{ii}+M_{j}+M_{zd}, S_{jj}+S_{ii}+S_{zd}$	$M_{i0}+M_{jj}+M_{zd}, S_{jj}+S_{zd}$	$M_{i0}+M_{jj}+M_{zd0}, S_{jj}$	$M_{i0}+M_{j0}+M_{zd0}, 0$
	{i,0, zd}	$M_{ii}+M_{zd0}, S_{0j}+S_{ii}$	$M_{ii}+M_{zd}, S_{0j}+S_{ii}+S_{zd}$	$M_{i0}+M_{zd}, S_{0j}+S_{zd}$	$M_{i0}+M_{zd0}, S_{0j}$	$M_{i0}+M_{zd0}, 0$

Table 3: Exports, prices and market shares as a function of fixed and transaction costs ($c_j - c_i = 0$)

			t_z = 0	5	10	15	20	25
D_z	0	P_z	100	108	116	124	132	148
		X_z	100	96	92	87	83	75
		XM_z (%)	*50*	*56.6*	*63.9*	*71.8*	*80.6*	*100*
		XS_z (%)	*50*	*43.4*	*36.1*	*28.2*	*19.4*	*0*
	100	P_z	100	116	132	124	132	148
		X_z	100	92	83	87	83	75
		XM_z (%)	*50*	*50*	*50*	*71.8*	*80.6*	*100*
		XS_z (%)	*50*	*50*	*50*	*28.2*	*19.4*	*0*
	300	P_z	100	116	132	148	132	148
		X_z	100	92	83	75	83	75
		XM_z (%)	*50*	*50*	*50*	*50*	*80.6*	*100*
		XS_z (%)	*50*	*50*	*50*	*50*	*19.4*	*0*
	500	P_z	100	116	132	148	165	181
		X_z	100	92	83	75	66	58
		XM_z (%)	*50*	*50*	*50*	*50*	*50*	*50*
		XS_z (%)	*50*	*50*	*50*	*50*	*50*	*50*

Table 4: Exports, prices and market shares as a function of ($c_j - c_i$) and transaction costs ($D_z = 300$)

			t_z = 0	5	10	15	20	25
$(c_j - c_i)$	-1	P_z	98	115	131	147	131	139
		X_z	101	92	84	75	84	80
		XM_z (%)	*48.7*	*48.6*	*48.5*	*48.3*	*78.8*	*88.3*
		XS_z (%)	*51.3*	*51.4*	*51.5*	*51.7*	*21.2*	*11.7*
	0	P_z	100	116	131	148	132	148
		X_z	100	92	83	75	83	75
		XM_z (%)	*50*	*50*	*50.0*	*50.0*	*80.6*	*100*
		XS_z (%)	*50*	*50*	*50.0*	*50*	*19*	*0*
	1	P_z	102	118	134	150	148	148
		X_z	99	91	82	91	75	75
		XM_z (%)	*51.3*	*51.4*	*51.5*	*51*	*100*	*100*
		XS_z (%)	*48.7*	*48.6*	*48.5*	*49*	*0*	*0*
	2	P_z	103	119	135	152	168	148
		X_z	98	90	81	119	64	75
		XM_z (%)	*51.3*	*51.4*	*51.5*	*51*	*100*	*100*
		XS_z (%)	*48.7*	*48.6*	*48.5*	*49*	*0*	*0*

Figure 1: Market structure as a function of fixed and transaction costs (c_j-c_i=0)

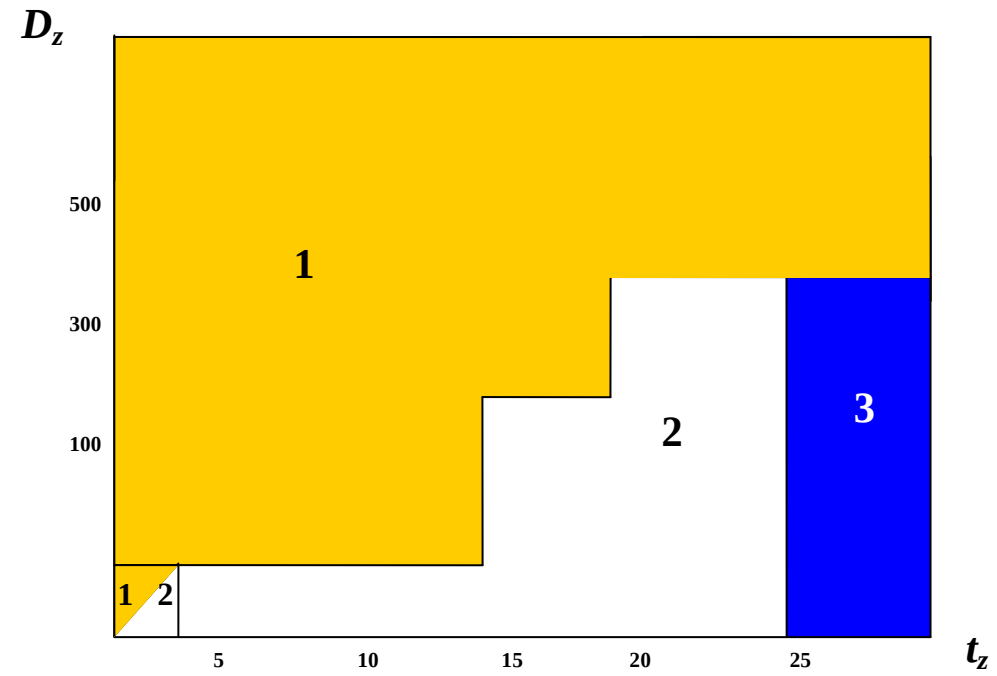

Figure 2: Market structure as a function of the cost gap and of transaction costs (D_z=300)