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Does Trade Liberalisation Damage Firms in Large Countries? Cost and Size Asymmetries in Intra-Industry Trade

by

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Abstract

This paper studies the effect of trade liberalisation in oligopolistic markets when there are asymmetries across countries. We consider two types of asymmetry: costs of production and market size. We show that trade liberalisation in oligopolistic markets always increases the social welfare of small countries but may reduce the social welfare of larger countries even when their rivals are high-cost. This is contrary to the traditional view that trade barriers protect small inefficient producers, and that special measures in favour of peripheral economies may be needed when trade is liberalised.

Outline

Non-Technical Summary

Membership of the European Union is currently a key political objective of the central and eastern European countries (CEECs). There are however fears that the integration of this group of small peripheral economies with their much larger neighbour could lead to severe and possibly long-lived transitional problems, particularly for manufacturing industry. In this paper, we study the transition from autarky to free trade in a model of intra-industry trade, in the presence of size and cost asymmetries.

In our model, total world welfare always increases as a result of trade liberalisation as output expands. The impact of trade liberalisation on social welfare of the individual countries on the other hand crucially depends on the relative size and efficiency of the parties concerned. We show that, contrary to the traditional view, small countries will always benefit from liberalisation, whether or not they are relatively efficient. Hence, even without special measures in favour of the peripheral economies such as the European Union's Regional Fund, small countries may find further international integration economically attractive. By contrast, since the economic welfare of larger countries may fall as a result of trade liberalisation even if their rivals are high-cost, non-economic benefits from integration, such as greater political stability in neighbouring countries, may be necessary if trade liberalisation is to progress further.

1 Introduction

Membership of the European Union is currently a key political objective of the central and eastern European countries (CEECs). There are however fears that the integration of this group of small peripheral economies with their much larger neighbour could lead to severe and possibly long-lived transitional problems, particularly for manufacturing industry. The experience of the eastern part of Germany since reunification is not reassuring in this respect. The removal of trade barriers between the CEECs and the EU may need to be accompanied by EU regional funding on a large scale to combat adjustment difficulties. In this paper, we study the transition from autarky to free trade in a model of intra-industry trade, in the presence of size and cost asymmetries. We show that contrary to the conventional view that market integration is a threat to the survival of high cost firms in small countries, reductions in trade barriers may increase the output share of the less efficient producers. The welfare of large countries with efficient firms may decrease following trade liberalisation, even when their rivals are high-cost.

Manufacturing industry in the EU is often characterised as oligopolistic in structure. A simple framework for analysing integration in oligopolistic markets is given in the duopoly models introduced by Brander (1981) and Brander and Krugman (1983). Even with homogeneous goods, intra-industry trade is generated in these models, where imports serve to curb the market power of each firm in its domestic market. With fixed numbers of firms, influencing the location of excess profits provides a rationale for strategic intervention. Brander and Spencer (1984) examine the use of tariffs under Cournot competition, while Dixit (1984) considers also export subsidies or subsidies on local sales. Krugman and Venables (1990) find that, with differences in country size but identical marginal costs, the removal of tariff barriers may have an ambiguous effect on welfare in the small country. Trade liberalisation initially has a negative effect on profits as market power at home is undermined, which with further reductions in trade barriers is later outweighed higher exports to the large country market.

In this paper we explore economic integration between two countries in the presence of cost and size asymmetries. The paper is organised as follows. In section two we set out the basic oligopolistic model used in the analysis and consider the conditions under which different trade regimes may exist. Section three then considers the impact of trade liberalisation when the countries are symmetric. Sections four and five consider how the conclusions

reached differ when production cost and size asymmetries exist, with section six drawing together both elements simultaneously. Section seven concludes.

2 The model

In our model there are two countries (1 and 2) and in each there is one firm. The two firms produce a homogeneous good and compete in the world market. Both firms have constant return to scale cost functions denoted by $C_i(x_i) = c_i x_i$, i=1,2. There is a constant cost of t per unit of output exported to the other country. This can be interpreted in a number of ways. Krugman and Venables (1990) and Naylor (1998) view it as capturing all costs associated with international trade, for example transaction, transport and tariff costs. We shall interpret it more narrowly as a common tariff, from which the governments derive revenue.

Each firm regards each country as a separate market and chooses the profit-maximising quantity for each market, on the Cournot assumption that the other firm's output in each market is given. Profits of the firms can be written as:

$$\Pi_i = (p_i - c_i)x_{ii} + (p_j - c_i - t)x_{ij} \quad i, j = 1,2, \qquad i \neq j \tag{1}$$

where p_i is the price of the good in country i, c_i is the constant cost in country i, t is the constant unit trade cost, x_{ii} is the production of country i for consumption in country i, and x_{ij} is the production of country i for consumption in country j. For simplicity, we assume that inverse demand functions are linear:

$$p_i = a - \frac{b}{s_i}(x_{ii} + x_{ji}) \tag{2}$$

where s_i is a measure of the market size of country i. Substituting (2) in (1), we obtain as profits:

$$\Pi_i = (a - \frac{b}{s_i}(x_{ii} + x_{ji}) - c_i)x_{ii} + (a - \frac{b}{s_j}(x_{jj} + x_{ij}) - c_i - t)x_{ij} \tag{3}$$

Differentiation of (3) allows us to obtain the following first-order conditions for profit-maximisation:

$$\frac{\partial \Pi_i}{\partial x_{ii}} = a - \frac{2b}{s_i}x_{ii} - \frac{b}{s_i}x_{ji} - c_i = 0 \tag{4}$$

$$\frac{\partial \Pi_i}{\partial x_{ij}} = a - \frac{2b}{s_j} x_{ij} - \frac{b}{s_j} x_{jj} - c_j - t = 0 \qquad (5)$$

These expressions can be interpreted as the firm's output reaction functions with respect to the rival firm's output. Solving this system we can obtain an expression for output in each market as a function of production costs and trade barriers:

$$x_{ii} = \frac{s_i}{3b}(a - 2c_i + c_j + t) \qquad (6)$$

$$x_{ij} = \frac{s_j}{3b}(a - 2c_i + c_j - 2t) \qquad (7)$$

Note that these expressions have been derived without reference to the level of the trade cost, *t*. In fact the level of *t* is crucial in determining the form of trade relations. If *t* is sufficiently high then no trade takes place. As *t* reduces then one way trade begins, until it reduces to such a level that both countries begin exporting. We now formally derive the conditions for these different regimes.

2.1 Autarky

When *t* is large enough there is no trade,

$$t \geq (a - 2c_i + c_j)/2 \qquad (8)$$

In such a situation firms produce for their home markets only and the equilibrium level of output in each country is given by:

$$x_{ii} = \frac{s_i}{2b}(a - c_i) \qquad x_{ij} = 0 \qquad (9)$$

Since each firm is acting as a monopolist in their home country, output is determined by the level of demand, the size of the country and the efficiency with which the firm produces output.

It is useful at this stage to note that total output is given by

$$X = x_{ii} + x_{jj} = \frac{s_i}{2b}(a - c_i) + \frac{s_j}{2b}(a - c_j) \qquad (10)$$

and that the share of output produced by country i is given by:

$$\alpha_i = \frac{s_i(a - c_i)}{a(s_1 + s_2) - s_i c_i - s_j c_j} \qquad (11)$$

It is also possible to calculate the level of welfare in the two countries under autarky. Profits and consumer surplus, CS_i, are given by:

$$\Pi_i = \frac{s_i}{4b}(a - c_i)^2 \tag{12}$$

$$CS_i = \frac{s_i}{8b}(a - c_i)^2 \tag{13}$$

and since under autarky tariff revenue is zero, social welfare is given by the sum of these two quantities:

$$W_i = \frac{3s_i(a - c_i)^2}{8b} \tag{14}$$

2.2 One-way trade

As trade barriers fall, eventually it will become profitable for exporting to commence. However this will not at first be two way trade, trade barriers being too high for one of the countries to trade but not for the other. Instead only the more efficient country will export. Without loss of generality, we will assume that the production cost in country 1 is higher than in country 2. In this case if the level of trade barriers falls in the range of values:

$$(a - 2c_1 + c_2)/2 \le t < (a - 2c_2 + c_1)/2 \tag{15}$$

then only country two will export:

$$x_{11} = \frac{s_1}{3b}(a - 2c_1 + c_2 + t) \qquad x_{12} = 0 \tag{16}$$

$$x_{22} = \frac{s_2}{2b}(a - c_2); \qquad x_{21} = \frac{s_1}{3b}(a - 2c_2 + c_1 - 2t) \tag{17}$$

Note that exports of country 1 are zero, and home sales of the firm in country 2 is not affected by the level of the tariff as it faces no competition from overseas. The share of total output produced by each firm is given by:

$$\mathsf{a}_1 = \frac{2s_1(a - 2c_1 + c_2 + t)}{2s_1(2a - c_1 - c_2 - t) + 3s_2(a - c_2)} \tag{18}$$

$$\mathsf{a}_2 = \frac{2s_1(a + c_1 - 2c_2 - 2t) + 3s_2(a - c_2)}{2s_1(2a - c_1 - c_2 - t) + 3s_2(a - c_2)} \tag{19}$$

Turning to the level of welfare in the two countries, equilibrium profits and consumer surplus are given by:

$$\Pi_1 = \frac{s_1}{9b}(a - 2c_1 + c_2 + t)^2 \tag{20}$$

$$\Pi_2 = \frac{s_2}{4b}(a - c_2)^2 + \frac{s_1}{9b}(a + c_1 - 2c_2 - 2t)^2 \quad (21)$$

$$CS_1 = \frac{s_1}{18b}(-2a + c_1 + c_2 + t)^2 \quad (22)$$

$$CS_2 = \frac{s_2}{8b}(a - c_2)^2 \quad (23)$$

and tariff revenue in the two countries is:

$$T_1 = \frac{s_1}{3b}(a - 2c_2 + c_1 - 2t)t \qquad T_2 = 0 \quad (24)$$

This implies that the level of social welfare in the two countries takes the form:

$$W_1 = \frac{1}{6b}(s_1(2a^2 - 3t^2 + 2a(t - 2c_1) + 3c_1^2 - 2(t + c_1)c_2 + c_2^2)) \quad (25)$$

$$W_2 = \frac{1}{24b}(\frac{8}{3}s_1(a - 2t + c_1 - 2c_2)^2 + 9s_2(a - c_2)^2) \quad (26)$$

2.3 Two-way (cross-hauling) trade

Finally we consider the situation in which trade barriers have fallen sufficiently low to allow for two-way trade. That is:

$$t < (a - 2c_1 + c_2)/2 \quad (27)$$

$$x_{ii} = \frac{s_i}{3b}(a - 2c_i + c_j + t) \quad (28)$$

$$x_{ij} = \frac{s_j}{3b}(a - 2c_i + c_j - 2t) \quad (29)$$

Note that now both domestic output and exports are affected by tariffs, as there is now competition in both markets. As would be expected, increases in t reduce exports and increase production for home demand. Output share of each firm can be defined as:

$$\mathsf{a}_i = \frac{(s_1 + s_2)(a - 2c_i + c_j) + (s_i - 2s_j)t}{(s_1 + s_2)(2a - c_i - c_j - t)} \quad (30)$$

As can be observed, output share depends on production cost, market size and trade barriers, though market size only affects output share if tariffs are positive.

Turning to the elements of welfare, equilibrium profits, consumer surplus and tariff revenues are given by:

$$\Pi_i = \frac{s_i(a-2c_i+c_j+t)^2 + s_j(a-2c_i+c_j-2t)^2}{9b} \tag{31}$$

$$CS_i = \frac{s_i(-2a+c_i+c_j+t)^2}{18b} \tag{32}$$

$$T_i = tx_{ji} = \frac{s_i(a+c_i-2c_j-2t)t}{3b} \tag{33}$$

Which implies that total welfare in country i is given by

$$\begin{aligned} W_i &= \Pi_i + CS_i + T_i \\ &= \frac{1}{18b}[s_i(-2a+c_i+c_j+t)^2 + 2s_j(a-2c_i+c_j-2t)^2 \\ &\quad + 2s_i(a-2c_i+c_j+t)^2 + 6s_it(a+c_i-2c_j-2t)] \end{aligned} \tag{34}$$

Now that we have characterised the situations under autarky, one-way and two-way trade, we are in a position to consider the impact of trade liberalisation on the economies.

3 Trade liberalisation: the symmetric case

The case of trade liberalisation when the countries have the same cost structure and market size ($c_1 = c_2$, $s_1 = s_2$) is familiar in the literature[1]. A reduction in trade barriers produces the standard result that total output in each country increases. This is because, although each country reduces production for its own consumption, it increases the output for export to a greater extent.

Increased trade has two opposing effects on profits. Lower tariffs lead to greater competition from imports in the home market, resulting in lower home market sales at reduced prices. On the other, enhanced export opportunities and an increase in the foreign price net of trade costs leads to profit increases. Thus, from an initial situation of autarky, profits initially decrease until the latter effect comes to dominate. Note however that profits will be larger under autarky than free trade, since the firms possess monopoly power in the absence of trade.

[1] Proof of the main propositions is included as an appendix.

Although liberalisation has an ambiguous impact on profits, the same is not true of welfare, which always increases. Although the profits of firms may be reduced, increases in the level of consumer surplus are always sufficient to compensate.

Finally, note that in the symmetric case one-way trade cannot take place since one country is never disadvantaged relative to the other.

4 Production cost asymmetry

In this section we introduce the first type of asymmetry that we want to consider. Without loss of generality we assume that the firm in country 1 is less efficient than the firm in country 2 and so has higher costs, $c_1 > c_2$. We maintain the assumption that the market size of both countries is the same, $s_1 = s_2 = s$, though we relax this assumption in the next section. Given these assumptions, we now analyse the implication of tariff reductions on market outcomes in the two countries.

Case 1: One-way trade. $(a - 2c_1 + c_2)/2 \leq t\ (a - 2c_2 + c_1)/2$

From a situation of one way trade, the effect of trade liberalisation on production and output share is clear. If we start from autarky, a reduction in trade barriers allows the efficient firm to export to the other country, which does not export, reducing the share of world production of the less efficient firm. The maximum difference between output shares occurs when $t = (a - 2c_1 + c_2)/2$.

The reduction in t will impact on the level of profits which firm 1 and firm 2 receive:

$$\frac{d\Pi_1}{dt} = \frac{2s(a + t - 2c_1 + c_2)}{9b} > 0 \qquad (44)$$

$$\frac{d\Pi_2}{dt} = -\frac{4s(a - 2t + c_1 - 2c_2)}{9b} < 0 \qquad (45)$$

We find that firm 1 experiences a decrease in profits following trade liberalisation as it faces increased penetration in its domestic market, whereas firm 2 enjoys an increase in profits.

Clearly such changes will have deleterious effects on producer welfare in country one, though consumer surplus increases sufficiently to compensate for this. With respect to social welfare, it can be shown that:

$$\frac{dW_1}{dt} = \frac{s(a-3t-c_2)}{3b} < 0 \quad (46)$$

$$\frac{dW_2}{dt} = -\frac{4s}{9b}(a-2t+c_1-2c_2) < 0 \quad (47)$$

Thus, from an intial situation of one way trade, trade liberalisation increases welfare in both countries.

Case 2: Two-way (cross-hauling) trade. $t < (a-2c_1+c_2)/2$

Turning to the situation of two-way trade, a reduction in t decreases the sales of each firm to its home market and increases its sales to the foreign market. It can be seen however that the extent to which output changes depends only on market size and not on the relative efficiency of the firms.

$$\frac{\partial x_{ii}}{\partial t} = \frac{s}{3b} > 0 \quad (48)$$

$$\frac{\partial x_{ij}}{\partial t} = -\frac{2s}{3b} < 0 \quad (49)$$

The change in the total production of each country is:

$$\frac{\partial x_i}{\partial t} = \frac{-s}{3b} < 0 \quad (50)$$

Although relative costs do not affect the change in the level of output following reductions in t, they do affect the initial levels. The more efficient firm will have a larger share of total output.

An interesting implication of the model is however, that a reduction in trade barriers increases the share of world production of the higher cost firm and decreases the output share of the lower cost firm.

Proposition 1: *From an initial situation of reciprocal intra-industry trade* ($t < (a-2c_1+c_2)/2$), *a decrease in trade costs will increase output share of the less efficient firm (firm 1) and will decrease output share of the more efficient firm (firm 2).*

The demonstration of the above proposition is straightforward. Examining the formula for output share:

$$\mathsf{a}_i = \frac{2s(a-2c_i+c_j)-st}{2s(2a-c_i-c_j-t)} \quad (51)$$

the derivative of output share with respect to t is given by:

$$\frac{\partial a_i}{\partial t} = \frac{-3(c_i - c_j)}{2(-2a + c_i + c_j + t)^2} \quad \begin{array}{lll} >0 & if & c_i < c_j \\ <0 & if & c_i > c_j \end{array} \qquad (52)$$

Conversely, starting from a situation in which t=0, increases in t reinforce the effect of cost asymmetries on output shares.

Combining this result with that of the previous section, it can be seen that, in terms of output share, the less efficient country would prefer (1) autarky to any position of one way trade and (2) free trade to any situation of restricted two-way trade. Conversely, the more efficient country obtains its largest share of the market at the point where tariffs allow it to begin importing, i.e. where t= (a-c)/2.

Once again the change in the output share of the two countries will impact on profits, as well as on total welfare. Turning to profits first, the impact of changes in trade barriers is given by:

$$\frac{\partial \Pi_i}{\partial t} = \frac{-2(a - 2c_i + c_j)s + 10st}{9b} \quad \begin{array}{lll} <0 & if & t < \dfrac{a - 2c_i + c_j}{5} \\ >0 & if & t > \dfrac{a - 2c_i + c_j}{5} \end{array} \qquad (53)$$

Thus, as trade barriers fall from a high level the profits of firm 1 decrease as it loses output share, whereas profits of firm 2 increase. However, as we approach the situation of free trade, and t becomes sufficiently small, the profits of both firms increase as barriers are further reduced.

Proposition 2: *From an initial situation of reciprocal intra-industry trade, a decrease in trade costs increases the profits of the less efficient firm (firm 1) if* $t < (a - 2c_1 + c_2)/5$ *and increases the profits of the more efficient firm (firm 2) if* $t < (a - 2c_2 + c_1)/5$.

To summarise the findings of case 1 and case 2, we can distinguish three different regimes. As trade barriers decrease we move from a situation of autarky to one way trade. The more efficient firm begins to export and its output share and profits increase. When $t = (a - 2c_1 + c_2)/2$ then two-way trade begins and the efficient firm faces rivalry from its less efficient competitor. This decreases the efficient firm's output share and with it its

profits, which reach a minimum when $t = (a - 2c_2 + c_1)/5$. As trade barriers fall further, profits increase until t=0. For the less efficient firm, profits decrease as we move from autarky to one way trade, as it faces increased competition in its domestic market without benefiting from trade. The less efficient country benefits from two-way trade however, increasing both output share and profits.

Comparing the situation of autarky and free trade for the two counties, the difference in profits in the two situations is given by:

$$\Pi_i^{FT} - \Pi_i^A = \frac{2s(a - 2c_i + c_j)^2}{9b} - \frac{s(a - c_i)^2}{4b} \begin{array}{ll} <0 & if \quad c_i > c_j \\ >0 & if \quad c_i < c_j \end{array} \qquad (54)$$

Thus, the level of profits is lower in autarky compared to free trade for the efficient country and larger in autarky than in free trade for the less efficient country.

It should be noted however, that in terms of social welfare, both countries unambiguously prefer free trade to autarky:

$$\frac{dW_i}{dt} = \frac{s}{9b}(-a + 8c_i - 7c_j - t) < 0 \qquad (55)$$

In terms of social welfare:

$$W_i^{FT} - W_i^A = \frac{s}{18b}(4(a - 2c_i + c_j)^2 + (-2a + c_i + c_j)^2) - \frac{3s(a - c_i)^2}{8b} > 0 \qquad (56)$$

5 Market size asymmetry

In this section, we examine how market size asymmetry impacts on market outcomes as trade barriers are reduced. We assume that production costs are equal for both firms ($c_1 = c_2 = c$) whereas country 1 is smaller than country 2, that is $s_1 < s_2$.

Proposition 3: *From an initial situation of reciprocal intra-industry trade, a decrease in trade costs will increase the total output of the smaller country, and will decrease the total output of the larger country if* $2s_1 < s_2$.

The proof of this proposition is straightforward. The impact of an increase in trade barriers on the total output of the smaller country (1) is given by:

$$\frac{\partial x_1}{\partial t} = \frac{s_1 - 2s_2}{3b} \qquad (57)$$

which is negative, given the assumption that $s_1 < 2s_2$. Conversely, higher trade barriers have a positive effect on output in country 2 if $s_2 > 2s_1$.

$$\frac{\partial x_2}{\partial t} = \frac{s_2 - 2s_1}{3b} \qquad (58)$$

Starting from autarky, trade liberalisation will initially benefit production in the larger country, as the sole exporter, at the expense of production in the smaller country. Once trade barriers fall below (a-c)/2, two-way trade occurs and, unless the trade partners are of markedly unequal size, further trade liberalisation can then be expected to increase production in each country. However, if one country is more than double the size of the other then production declines in that country with falling trade barriers. This is because the beneficial impact on exports to the small country is more than offset by lost sales in the large home market due to increased imports.

Differing production effects are reflected also in the output shares of the two firms. These will be equal when there is free trade regardless of the size of the country in which the firm is based. Location does not matter. With rising trade barriers, the output share of the firm in the large country expands – location increasingly matters – until t = (a-c)/2 and two way trade ceases. Thereafter, higher tariffs erode the large country's exports and output share until autarky is reached.

Proposition 4: *From an initial situation of reciprocal intra-industry trade, a decrease in trade costs will increase the output share of the small country, and reduce the output share of the large country if* $t < (a-c)/2$.

The proof of this proposition can be seen by examining the derivative of output share with respect to t.

$$\frac{\partial \mathsf{a}_i}{\partial t} = \frac{3(a-c)(s_i - s_j)}{(s_1 + s_2)(-2a + 2c + t)^2} \qquad \begin{array}{ll} >0 & \text{if} \quad s_i > s_j \\ <0 & \text{if} \quad s_i < s_j \end{array} \qquad (59)$$

We can examine the implications of these changes in production and output share on the profit levels of the firms.

Proposition 5: *From an initial situation of reciprocal intra-industry trade, a decrease in trade costs increases the profits of both firms if* $t < (2(a-c)(2s_i - s_j))/(2s_j + 8s_i)$.

However if country 1 is more than twice the size of country 2, profits of firm 1 always decrease.

The proof of this proposition can be seen by examining the derivative of profits with respect to t.

$$\frac{\partial \Pi_i}{\partial t} = \frac{2(a-c)(s_i - 2s_j) + 2(s_i + 4s_j)t}{9b} \qquad >0 \ \textit{if} \qquad t > \frac{2(a-c)(2s_j - s_i)}{2s_i + 8s_j} \quad (60)$$

$$<0 \ \textit{if} \qquad t < \frac{2(a-c)(2s_j - s_i)}{2s_i + 8s_j}$$

Thus if the large country is more than double the size of the small country, and there is two-way trade, the larger country will experience a decrease in profits with trade liberalisation as it faces increased competition. Large countries may therefore wish to use trade barriers to increase the profits of domestic firms.

Turning to the impact of trade liberalisation on social welfare it clear that this also depends on market size.

$$\frac{\partial W_i}{\partial t} = \frac{1}{9b}(s_i(3a - 3c - 9t) + s_j(-4a + 4c + 8t)) < 0 \qquad \textit{if} \quad t < \frac{(4s_j - 3s_i)(a-c)}{8s_j - 9s_i} \quad (61)$$

If the size difference is not too large then social welfare increases in both countries. However, if one country is large compared to the other ($s_j > 4/3s_i$) then its welfare decreases since the increase in consumer surplus is insufficient to compensate for the loss in profits. The social welfare of the small country still increases.

As before we can summarise our findings by comparing the situations under free trade and autarky.

$$\Pi_i^{FT} - \Pi_i^{A} = \frac{(s_i + s_j)(a-c)^2}{9b} - \frac{s_i(a-c)^2}{4b} > 0 \qquad \text{if} \qquad s_i < \frac{4}{5}s_j \qquad (62)$$

$$W_i^{FT} - W_i^{A} = \frac{6s_i(a-c)^2 + 2s_j(a-c)^2}{18b} - \frac{3s_i(a-c)^2}{8b} < 0 \qquad \text{if} \qquad s_i > \frac{16}{6}s_j \qquad (63)$$

For the smaller country profits and social welfare are always larger in free trade than in autarky, whereas for the large country this is only true as long as the size difference is not too great.

6 Production cost and market size asymmetries

In the previous sections we examined the implications of trade liberalisation for market outcomes. A principal finding of this analysis is that, in the presence of cost asymmetries, both countries experience an increase in welfare. However, if they are sufficiently different in size, then the larger country may suffer a fall in welfare as it loses output share and profits. We now consider the situation in which there are asymmetries in both production costs and market size. In such a situation, the welfare reducing impact of size differences is modified by the presence of cost asymmetries. This can be succinctly summarised by figure one. This represents the possible combination of size and cost asymmetries within our model. Point *a* represents the situation of symmetry where the countries are of equal size and equal efficiency.

Also plotted on this diagram are the relative size/relative efficiency combinations for which the welfare of the large country remains unchanged as a result of liberalisation. That is, the locus of points defined by:

$$\frac{\partial W_i}{\partial t} = \frac{1}{9b}(s_i(3a - 3c - 9t) + s_j(-4a + 4c + 8t)) = 0 \qquad (70)$$

$$\frac{s_1}{s_2} = \frac{4a - 8c_1 + 4c_2 - 8t}{3a - 3c_2 - 9t} \qquad (71)$$

which describes a downward sloping boundary that is asymptotic to the $c_1/c_2 = 0$ locus. This illustrates that the larger a country is relative to its trading partner, the more efficient it has to be in order to benefit from reductions in trade barriers under two way trade. The figure allows us to derive the following conclusions concerning the welfare effects of liberalisation:

- small countries always benefit from liberalisation whether they are relatively more efficient (segment F) or less efficient (E).
- large inefficient countries will lose from trade liberalisation (A) unless the size and efficiency differences are small (B).
- efficient countries will gain from liberalisation (F and D) as long as they are not too large (C).

7 Conclusions

In this paper we have examined the effect of trade liberalisation in oligopolistic markets when there are asymmetries across countries. We consider two types of asymmetries: costs of production and market size. In our model, total world welfare always increases as a result of trade liberalisation as output expands. The impact of trade liberalisation on social welfare of the individual countries on the other hand crucially depends on the relative size and efficiency of the parties concerned. We show that, contrary to the traditional view, small countries will always benefit from liberalisation, whether or not they are relatively efficient. Hence, even without special measures in favour of the peripheral economies such as the European Union's Regional Fund, small countries may find further international integration economically attractive. By contrast, since the economic welfare of larger countries may fall as a result of trade liberalisation even if their rivals are high-cost, non-economic benefits from integration, such as greater political stability in neighbouring countries, may be necessary if trade liberalisation is to progress further.

Bibliography

Brander J. (1981) Intra-industry trade in identical commodities, *Journal of International Economics*, 11, pp1-14.

Brander J. and Krugman P. (1983) A reciprocal dumping model of international trade, *Journal of International Economics*, 15, pp313-321.

Brander, J. and Spencer, B. (1984): Tariff protection and imperfect competition, in H. Kierzkowski, ed., *Monopolistic competition and international trade*, Clarendon Press, Oxford.

Dixit, A. (1984): International trade policy for oligopolistic industries, *Economic Journal*, 94, supplement, 1-16.

Krugman P.R. and Venables A.J. (1990) 'Integration and the competitiveness of peripheral industry' Chapter 3 in C J Bliss and J B de Macedo (eds) *Unity with diversity in the European economy: the Community's southern frontier* (Cambridge: Cambridge University Press)

Naylor R. (1998) International Trade and economic integration when labour markets are generally unionised, *European Economic Review*, 42, p1251-1267.

Appendix: Trade liberalisation: the symmetric case

When the two countries have the same production cost and the same market size, that is, $c_1 = c_2$ and $s_1 = s_2$ a number of propositions may be straightforwardly demonstrated.

Proposition A1: *From an initial situation of reciprocal intra-industry trade, a decrease in trade costs will increase both total trade and total production in each country.*

Proof: Taking the derivatives of quantities with respect to t we obtain:

$$\frac{\partial x_{ij}}{\partial t} = -\frac{2s}{3b} < 0 \qquad \text{(A1)}$$

$$\frac{\partial x_{ii}}{\partial t} = \frac{s}{3b} > 0 \qquad \text{(A2)}$$

The change in the total production of each country is:

$$\frac{\partial x_{i}}{\partial t} = \frac{-s}{3b} < 0 \qquad \text{(A3)}$$

Proposition A2: *From an initial situation of reciprocal intra-industry trade, a decrease in trade costs will increase profits of the firms only if* $t < (a-c)/5$

Proof: The profits of a firm are given by:

$$\Pi_i = \frac{s(a-c+t)^2 + s(a-c-2t)^2}{9b} \qquad \text{(A4)}$$

Hence

$$\frac{\partial \Pi_i}{\partial t} = \frac{2(a-c)(-s)+10st}{9b} \quad < 0 \quad if \quad t < \frac{a-c}{5} \qquad \text{(A5)}$$

$$> 0 \quad if \quad t > \frac{a-c}{5}$$

Hence profits increase as t is reduced from $(a-c)/5$.

Note also:

$$\Pi_i^{FT} - \Pi_i^{A} = \frac{2s(a-c)^2}{9b} - \frac{s(a-c)^2}{4b} < 0 \qquad \text{(A6)}$$

Proposition A3: *From an initial situation of reciprocal intra-industry trade, a decrease in trade costs will increase consumer surplus and social welfare.*

Proof: Differentiating (32) and (34) with respect to t we obtain:

$$\frac{\partial CS_i}{\partial t} = \frac{-s(2a-2c-t)}{9b} < 0 \qquad \text{(A7)}$$

$$\frac{\partial W_i}{\partial t} = \frac{-s(a-c+t)}{9b} < 0 \qquad \text{(A8)}$$

Comparing social welfare under free trade and autarky:

$$W_i^{FT} - W_i^{A} = \frac{8s(a-c)^2}{18b} - \frac{3s(a-c)^2}{8b} > 0 \qquad \text{(A9)}$$

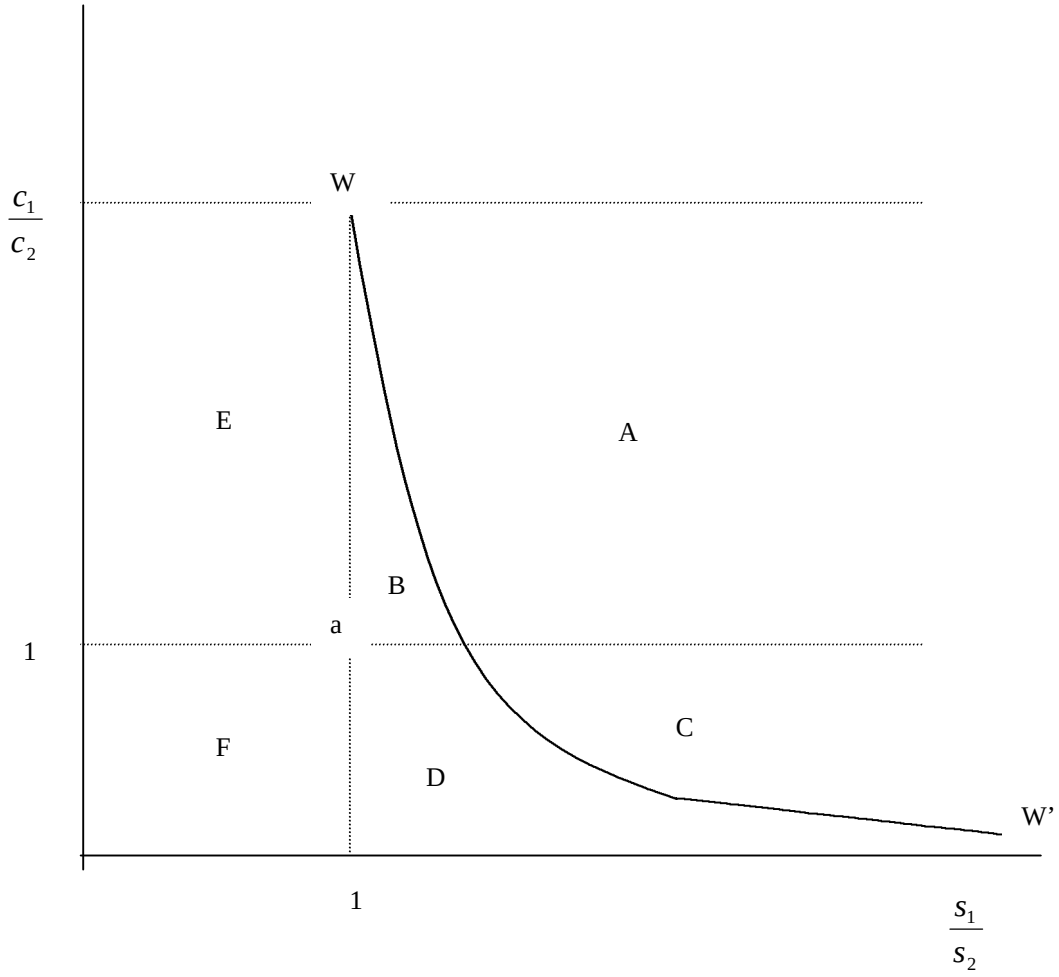

Figure One: The impact of size and cost asymmetries on social welfare