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REGIONAL MARKET AREAS AT THE EU BORDER

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Regional Market Areas at the EU Border

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1. Introduction

With the enlargement of the European Union (EU) and the negotiations with potential member countries and further candidates, the question arises, how to form the relationship to non-EU countries. The enlargement leads to new borders in new areas and to enlarged external frontiers with cross-frontier trade and markets. Therefore at the new EU border many new regional markets will emerge, in which – on the basis of lower production costs in many industries in non-EU countries – an import pressure arises. This import pressure calls for a political answer. In the past, the EU gave many different regional answers which produced preferential trade for more than 25 % of the whole EU trade with non-EU countries. In 1996, there was a hierarchy of EC trade regimes: In Eastern- and South-Eastern-Europe a free-trade area (Europe Agreements) covered Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, the Slovak Republic and Slovenia. In the Mediterranean area, there was a custom union with Turkey; free trade areas included Israel, Cyprus, and Malta. Non-reciprocal contractual preferences were agreed with Algeria, Egypt, Jordan, Morocco, Lebanon, Syria and Tunisia (Sapier [1998]). This trade policy followed the lines of general foreign policy, and the traditional policy of some EU states was based on interests in certain regional areas. Furthermore, the trade policy of the EU may not be understood without an investigation of the design and evolution of EU institutions (Bilal [1998]). This paper tries to give a theoretical and model based economic answer to the question, which trade policy is appropriate to rise the welfare of EU regions near borders. For this purpose, we concentrate our investigations on two extremes, on the one hand on free trade, and on the other hand on trade policy with import tariffs and export subsidies of non-EU countries. There is no doubt about the results of the applied model: Trade policy raises the welfare effects of the EU area and lowers these effects of the non-EU countries, which are in a position to make compensation payments to the EU to avoid a system of import tariffs and contrary export subsidies. Free trade also produces the highest world welfare.

This essay combines elements of international trade theory with a model of spatial oligopoly, i.e. with at least one supplier's market area stretching across the border. In an early paper, Benson and Hartigan [1983] demonstrate that import tariffs may reduce the (profit-maximizing) mill price, even that of the domestic firm. In further papers, these authors also tackle the effects of import quotas [1984] and the distributional incidence of tariffs [1987]. An early discussion of welfare effects in the mentioned analytical framework can be found for certain special cases in Porter [1984] as well as, with endogenous

revenue and protective tariffs, in Schöler [1990]. Heffley and Hatzipanayotou [1991, 1993] investigate the impact of tariffs on population distribution and land rents as well as on consumers' mobility. Furthermore, alternative conjectural variations and heterogenous goods are treated by Heffley, Hatzipanayotou und Mourdoukoutas [1993] in a spatial market model with tariffs. Hass [1996, 1997/98] extends the analysis to alternative models of spatial competition on the one hand, and to endogenous welfare maximizing tariff rates on the other hand. This kind of endogenous welfare maximizing tariff, though calculated in a different fashion, is also applied by Schöler [1997]. Hass and Schöler [1999] reach a differentiated welfare-theoretical assessment of export subsidies. Finally, there are two papers published by Schöler [1999a, 1999b], in which different trade policies are compared. In this paper, we want to investigate the trade policy of setting welfare maximizing tariffs for imported goods by the EU and the reactions of non-EU countries, which pay welfare maximizing export subsidies to their domestic industries. The paper is organised as follows: In Section 2, the assumptions and the spatial market model with trade policy are developed. In Section 3, we discuss the welfare effects of free trade and of trade policy (tariffs and export subsidies) by using a numerical example. In Section 4, we summarize the results of our spatial model of trade policy.

2. Model with Trade Policy

For simplification we want to introduce the following notations: In the sence of our model the EU area is the domestic state or country; all non-EU areas are foreign states or countries. Therefore, the world is the sum of the EU and non-EU countries. The regional markets at the EU border are represented by a one-dimensional space, which is divided by the EU border. It is appropriate to formulate some further assumptions common to the spatial pricing literature in order to keep the model manageable:

$A1$: Domestic and foreign consumers continuously occupy a homogenous line $\overline{0R}$ at uniform density equal to 1. The locations of the firms are exogenously given at the left and right ends of this line, i.e. at 0 for the domestic firm and at R for the foreign competitor. The foreign firm exports part of its production to the domestic market, so that it serves the foreign market between its location R and

the EU border R_G as well as the domestic market between the EU border R_G and the market area boundary R_C. The domestic firm delivers to the remaining part of the domestic market, covering $\overline{0R_C}$.

$$0 - - - - - - - - R_C - - - - - - - - R_G - - - - - - - - R$$

A2: To keep the algebra less cumbersome we assume domestic and foreign individual consumer demand to be identical with respect to utility and expenditure functions, and represented by a linear function of the respective delivered price $p(r)$:

$$q_i = 1 - p_i \quad and \quad p_i = m_i + r, \quad i = I, A, D, \quad r \in [0,\ R]. \tag{1}$$

The delivered prices of the domestic firm $p_I(r)$, of the foreign firm in the domestic market area $p_A(r)$ and in the foreign market area $p_D(r)$ are the sum of the mill prices m_I, m_A, or m_D, respectively, and the transportation costs between the production and consumption locations r, with r signifying the distance between the two locations. The freight rate per quantity and distance unit for domestic and foreign transportation is assumed to equal 1.

A3: Production technology and cost functions are identical in both countries. Hence, the cost functions read:

$$K_I = vK_A + (1 - v)K_D = K_f, \tag{2}$$

with variable costs set to zero. The parts of the fixed costs of the foreign firm which are attributable to the exports are vK_f with $v \in [0,\ 1]$.

A4: The firms aim at maximizing their profits under Löschian competition. The consumers aim at maximizing their consumers' surplus and purchase the good from the firm which offers the lowest delivered price.

A5: The trade policy of the domestic government (EU) comprises welfare maximizing import tariffs t^* and the answer of the foreign government (non-EU) is the grant of welfare maximizing export subsidies s^*.

A6: The model is confined to the short run analysis, i.e. relocations are neither undertaken nor expected of the competitors.

The existence of a spatial market implies the following conditions: (a) $m_I < m_A + R$ and $m_A < m_I + R$, respectively: A firm cannot be entirely pushed out of the market via price undercutting by the competitor at the former firm's own location. (b) $1 - m_I + R_C > 0$ and $1 - m_A + R - R_C > 0$, respectively: At the competition boundary R_C, the delivered

price is not allowed to be higher than or equal to the prohibitive price, which is: $R \leq m_I - m_A + 2R_C$. Due to the fact that at the competition boundary the delivered prices of both firms are identical, we get the admissible distance R between the firms' locations, with R_C being less or equal to the monopoly market size. If at least one of these two conditions is not fulfilled, the market will be divided into one or two spatial monopolies.

Under the assumptions $A1$ to $A6$, spatial competition under free trade can be modeled with $t = 0$ and $s = 0$. In the case of trade policy the model is the following. The domestic firm's profit is given by:

$$\Pi_I = m_I \int_0^{R_C} (1 - m_I - r)dr - K_f. \tag{3}$$

The profit-maximizing domestic mill price, as a function of the market area size, reads:

$$m_I^* = 0.5 - 0.25R_C. \tag{4}$$

Given assumption $A1$, the foreign firm serves the foreign market between R_G and R as well as a part of the domestic market $\overline{R_C R_G}$. The profit is given by:

$$\Pi_{A/D} = m_D \int_0^{D} (1 - m_D - r)dr + (m_A + s) \int_0^{R_G - R_C} (1 - m_A - D - t - r)dr - K_f, \tag{5}$$

where t is the domestic tariff on the quantity of imports, s the foreign export subsidies on the quantity of export and $D = R - R_G$. In the presence of tariffs, the foreign firm may determine a common mill price for its foreign market (m_A) and domestic market (m_D) and separate prices in the sense of spatial price discrimination. The profit-maximizing foreign mill price for the domestic market, as a function of the domestic market size, tariff, and subsidies, reads:

$$m_A^* = 0.25[R_C - 2D - R_G + 2(1 - s - t)], \tag{6}$$

and the profit-maximizing foreign mill price for the foreign market

$$m_D^* = 0.5 - 0.25D. \tag{7}$$

Due to the fact that according to $A4$, the delivered prices of both firms are identical at the competition boundary R_C:

$$m_A^* + D + R_G - R_C = m_I^* + R_C, \tag{8}$$

this boundary with profit-maximizing foreign and domestic mill prices m_A^*, m_I^* can endogenously be derived as:

$$R_C^* = (1/6)[2D + 3R_G - 2(s - t)]. \tag{9}$$

Inserting this result (9) into the price equations (4) and (6), the mill prices will read:

$$m_I^* = (-1/24)[2D + 3R_G - 2(s - t + 6)] \tag{10}$$

and

$$m_A^* = (-1/24)[(10D + 3R_G + 2(7s + 5t - 6)], \tag{11}$$

with $\partial m_I^*/\partial t = -1/12$, $\partial m_I^*/\partial s = 1/12$, $\partial m_A^*/\partial t = -5/12$, and $\partial m_A^*/\partial s = -7/12$. The domestic tariff revenue equals:

$$T = t \cdot \int_0^{R_G - R_C^*} (1 - m_A^* - D - t - r)dr, \tag{12}$$

and the foreign expenditures for export subsidies

$$S = s \cdot \int_0^{R_G - R_C^*} (1 - m_A^* - D - t - r)dr. \tag{13}$$

Under exogenous tariff and subsidy rates the domestic revenue and foreign expenditures depend solely on the transport costs between the locations of the firms and the border between the EU and non-EU countries.

To calculate the welfare maximizing tariff and subsidy rates, we have to choose an appropriate definition of welfare. One plausible definition of the domestic welfare would be the sum of the profit of the domestic firm, the domestic consumers' surplus and the tariff revenue. Following this definition, welfare reads $\Omega_I = \Pi_I + \Lambda_I + \Lambda_A + T$, where Π_I is the profit of the firm, Λ_I is the consumers' surplus in the market area of the domestic firm, and Λ_A symbolizes consumers' surplus in the domestic market area of the foreign firm. Therefore, the foreign welfare reads $\Omega_{A/D} = \Pi_A + \Pi_D + \Lambda_D - S$, where Π_A is the profit of the foreign firm in the domestic market area and Π_D in the foreign market area, and Λ_D symbolizes the consumers' surplus in the foreign market area of the foreign firm. The consumers' surpluses are

$$\Lambda_I = \int_0^{R_C^*} 0.5(1 - m_I^* - r)^2 dr, \tag{14}$$

$$\Lambda_A = \int_0^{R_G - R_C^*} 0.5(1 - m_A^* - D - t - r)^2 dr, \tag{15}$$

$$\Lambda_D = \int_0^D 0.5(1 - m_D^* - r)^2 dr. \tag{16}$$

Under consideration of R_C^* and the equations (3), (5) and (12) to (16), the welfare effects are functions of the distance between the locations of the firms and the border as well as t and s. If we maximize the domestic welfare function Ω_I with respect to t and the foreign welfare function $\Omega_{A/D}$ with respect to s, we get a system of two equations with two unknown variables:

$$t = (-1/98)[[1600D^2 - 32D(67R_G + 100s + 47) + 1465R_G^2 + 8R_G(268s + 173)$$
$$+16(100s^2 + 94s - 47)]^{0.5} + 2(29D - 16R_G - 29s - 20)], \tag{17}$$
$$s = (1/70)[2[400D^2 + 20D(2(20t - 17) - 9R_G) + 351R_G^2 - 36R_G(5t + 8)$$
$$+4(100t^2 - 170t + 109)]^{0.5} + 30D - 33R_G + 2(15t - 4)]. \tag{18}$$

If we solve the equations (17) and (18) simultaneously and put the results for t^* and s^* into the welfare equations, these terms only depend on R_G and D:

$$\begin{aligned} \Omega_I &= \Omega_I(R_G, D) \\ \Omega_{A/D} &= \Omega_{A/D}(R_G, D) \end{aligned} \qquad with \qquad \begin{cases} s = s^*, \;\; t = t^*, \\ m_I = m_I^*, \;\; m_A = m_A^*, \\ m_D = m_D^*, \;\; R_C = R_C^*. \end{cases} \tag{19}$$

To evaluate the welfare results, it is appropriate to assume numerical values for the exogenous variables R_G and D because the solutions of the equation system((17), (18)), and hence the equations in (19), are very extensive.

4. Some Numerical Results

First of all, it is convenient to reduce the three-dimensional problem (R_G, D, Ω) into a two-dimensional space. For this purpose we assume $R_G/3 = D$ which means that the ratio of the distances between the location of the domestic firm and the border and the location of the foreign firm and the border is always $1/3$. The range of distance between the domestic firm and the border is $R_G \in [0, \;\; 1]$ because in a linear spatial market, under the applied assumptions, the maximal distance between both competitive firms is $R \leq 4/3$

. Figure 1 shows the downward-sloping curves of tariffs and subsidies for the range of $R_G \in [0,\ 1]$. For the spaceless market $R_G = 0$, the optimal tariff rate and the optimal subsidy rate yield $t^* = s^* = 0.5$. In the case of the maximal distance between the locations $R_G = 1$, we get $t^* = 0.205$ and $s^* = 0$.

here: Figure 1: Welfare maximizing tariff and subsidy rates

To understand figure 2, it is necessary to remember the fact that we apply a constant relation between R_G and D. Therefore, it is not appropriate to compare the domestic and foreign welfare, but it is worthy to make a comparison for the free trade and trade policy cases. It is a well-known result of the traditional theory of international trade that import tariffs raise the welfare of the country which collects the customs duty and lower the welfare of the exporting country. This is also the case in our model, if the foreign country answers with export subsidies and if, in addition, both countries are welfare orientated in their trade policies.

here: Figure 2: Welfare effects of free trade and trade policy

In figure 3, we define the foreign gain under free trade (FG) as the difference between welfare under free trade and welfare under trade policy. The definition of domestic gain under trade policy (DG) is similar and is defined as welfare under trade policy minus welfare under free trade. The world welfare is always higher under free trade policy, because for all $R_G \in [0,\ 1]$ we obtain $FG > DG$. The foreign country (non-EU country) is in the position to take compensation payments of DG to the EU country to avoid the trade policy of import tariffs and export subsidies and remains the foreign net gain $FG - DG$.

here: Figure 3: Comparison of trade regimes

Figure 4 shows us the tariff revenue T of the domestic administration and the subsidy expenditure S of the foreign government. Both curves have maximums at certain geographic dimensions: $T_{max} = 0.012037$ at $R_G = 0.7$ and $S_{max} = 0.004487$ at $R_G = 0.3$. For simplification we assume in this model that the production costs are the same in both countries with variable costs equal to zero and $K_I = vK_A + (1 - v)K_D = K_f$. All results will be influenced by different production costs and a tariff policy without subsidies (Schöler [1997]) or export subsidies without tariffs (Hass/Schöler [1999]).

here: Figure 4: Tariff revenue and subsidy expenditure

5. Conclusions

The market results of a spatial bordercrossing dyopoly as shown above depend on the distance parameters R_G, D and hence on R, the distance between the producers' locations. The national welfare effects and the design of an optimal trade policy also depend on the distance between the location of the producer and the EU border. Furthermore, the solutions of the model depend on the choice of the policy instruments (tariff and subsidy), the conjectural behaviour of the market members (Löschian competition), their pricing strategy (price discrimination and fob-pricing), and the number of acting firms and administrations.

Which results and conclusions can be drawn for the foreign policy of the EU, if we assume that all involved administrations adjust the policy instruments to the goal of welfare maximization? First of all, the answer to the import pressure of non-EU countries in border-adjacent EU areas is to establish import tariffs, also in the case of reactions by those countries with export subsidies. But in this situation the welfare losses of the non-EU countries amount to such a considerable volume that they agreed on paying compensations to achieve international free trade. These compensations may be granted in different ways, not only by financial transactions, but also by demonstrating a certain political behaviour in various political fields. Under rational behaviour of governments the announcement of free trade in the tariff case (or the announcement of tariffs in the situation of free trade) may be sufficient to lead to monetary or political payments. It may be possible indeed that such circumstances explain the actual findings of many different regional arrangements and free trade areas.

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