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Endogenous approach to the principle of retaliation in base models of strategic trade policy

Abstract. The aim of the paper is to examine the effects of endogenous approach to the principle of retaliation in base models of strategic trade policy in the sphere of welfare. Two main models are considered: the model of homogeneous international duopoly with behaviours according to Cournot's (Brander – Spencer) principles of quantitative competition and the model of heterogeneous international duopoly with behaviours according to Bertrand (Eaton – Grossman) principles of price competition. The base models of strategic trade policy do not take into account the possibility of participation of the governments in a strategic game on imperfect market but they only take into account mutual behaviour of enterprises. Including the principle of retaliation in the model based on Cournot's quantitative competition leads to "the prisoner's dilemma" which means that it is impossible to reconcile domestic rationality with international rationality while making decisions as regards behaviour on the market. Such a dilemma does not occur in the case of the model based on the principles of price competition because both countries achieve welfare benefits due to the fact that one of them applies the instrument of export tax. However, it may be concluded that although under quantitative competition the mutual implementation of export subsidy can lead to unfavourable consequences for the level of welfare in both countries, it is still possible to solve "the prisoner's dilemma" through various forms of a long-term co-operative game. On the other hand, under price competition where there is no contradiction between domestic rationality and international rationality, the consequences for the world economy may be less favourable because when both countries can achieve benefits neither of them will be interested in returning to free trade.

Keywords: strategic trade policy, trade policy, retaliation, export subsidy, export tax, quantitative competition, price competition, international duopoly, strategic game.

JEL codes: C71, C72, D21, D43, D60, F13, G20, L13.

1. Assumptions and aims of base models of strategic trade policy

Base models of strategic trade policy rely on the concept of international duopoly which includes goods of homogeneous or heterogeneous character and behaviour of enterprises according to the Cournot's principle of quantitative competition or Bertrand's principles of price competition.

A primary basis for the development of strategic trade policy was created by the concept of influence of trade policy on the level of welfare of the countries participating in international division of labour, worked out by J.A. Brander and B.J. Spencer¹. In its model approach it is a basis for other numerous works concerned with the problems of the "new" theory of international trade².

The essence of Brander-Spencer model provides evidence that introduction of export subsidy – under imperfect competition – has a positive influence on welfare of the country which intervenes in the sphere of trade policy. In order to prove that such influence exists the authors base on a few assumptions which decide to what extent the conclusions formulated on the basis of the model are adequate³:

- the case of imperfect market under consideration is international duopoly,
- each of the enterprises operates in a different country,
- both enterprises under analysis manufacture homogeneous goods,
- products manufactured by both firms are sold only on the market of the third country⁴,

¹ See J.A. Brander, B. J. Spencer, *International R&D Rivalry and Industrial Strategy*, "Review of Economic Studies" 1983, No. 50, pp. 707-722; J. A. Brander, B. J. Spencer, *Export Subsidies and International Market Share Rivalry*, "Journal of International Economics" 1985, No. 18, pp. 83-100; J. A. Brander, *Rationales for Strategic and Industrial Policy*, in: *Strategic Trade Policy and the New International Economics*, ed. P. R. Krugman, The MIT Press, Cambridge, Massachusetts, London 1986, pp. 23-46.

² More on the origins of strategic trade policy and its place in "the new" theory of international trade see T. Rynarzewski, *Teoretyczne aspekty strategicznej polityki handlu międzynarodowego*, in: *Teoretyczne i empiryczne aspekty współczesnych międzynarodowych stosunków gospodarczych*, ed. T. Rynarzewski, Wydawnictwo Akademii Ekonomicznej in Poznań, Poznań 2001, pp. 72-80.

³ As regards assumptions see J. A. Brander, B. J. Spencer, *Export Subsidies...*, op. cit., pp. 83-100; J. A. Brander, *Strategic Trade Policy*, Working Paper No. 5020, National Bureau of Economic Research, Cambridge 1995, p. 11; J. Wild, *Strategische Handelspolitik. Alternative Instrumente bei oligopolistischem Wettbewerb*, Peter Lang Verlag GmbH, Frankfurt am Main 1997, pp. 16-17; P. Welzel, *Strategische Handelspolitik. Nationale Anreize und internationale Koordinationsaufgaben*, Physica – Verlag, Heidelberg 1991, p. 65; E. Paulsen, *Strategische Handelspolitik und hochtechnologische Industrien*, Verlag V. Florentz GmbH, München 1989, p. 39; H. Feldman, *Wie merkantylistisch ist die Theorie strategischer Handelspolitik?*, "Jahrbücher für Nationalökonomie und Statistik" 1993, No. 212, p. 528.

⁴ The goods manufactured are not offered in either of the countries where the two enterprises are based, nor in any other country apart from one concrete export market on which the joint output

- manufacturers behave according to Cournot's principles of quantitative competition, i.e. they treat the volume of production of their competitor in a duopoly as a given magnitude,
- the rate of export subsidy used by the government of a given country is also treated as a given magnitude,
- the government of the country which applies trade policy instruments knows the real structure of the market and behaviour of the enterprises which operate there,
- the aim of economic policy implemented by the government is maximisation of the country's welfare.

The second base model of strategic trade policy, Eaton-Grossman's model, shows that the growth of a country's welfare is also possible if the government of a given country applies another trade policy instrument than export subsidy – export tax. The authors' assumptions are more or less similar to those of Brander-Spencer's model⁵. The main differences refer to the following premises:

- both enterprises under analysis manufacture heterogeneous goods⁶,
- manufacturers behave according to Bertrand's principles of price competition, i.e. they treat the level of price of their competitor as a given magnitude,
- the level of export tax applied by the government of a given country is also treated as a given value.

The most significant similarity to the model based on the principles of behaviour according to Cournot's quantitative competition is that the goods manufactured by both enterprises of the duopoly are exported to the market of the third country. This means that those goods are not consumed in the countries where they are manufactured. Moreover, precisely as in the previous model, the aim of the government is to maximise social welfare. In this case it does not matter whether the priority is profits of a domestic enterprise or budget revenues obtained from the export tax imposed.

In the base models of strategic trade policy it is assumed that interactions between entities concern only enterprises. Practically it means an assumption that there

of both firms is sold. Due to this assumption it is possible to omit in the considerations on welfare consumer rent in both countries and concentrate only on profits generated by each firm.

⁵ See J. Eaton, G. M. Grossman, *Optimal Trade and Industrial Policy under Oligopoly*, in: *Imperfect Competition and International Trade*, ed. G. M. Grossman, The MIT Press, Cambridge, Massachusetts, London, 1994, pp. 121-139.

⁶ If the analysed enterprises manufactured substitute or identical products, demand in the third country would concentrate on the goods offered at a lower price. Then a phenomenon referred to as Bertrand paradox would occur. (more on this subject in J. Tyrole, *The Theory of Industrial Organization*, Cambridge, Massachusetts 1988, p. 209), reflected in the price competition where the price of goods would equal average costs (Comp. G. Bletschacher, H. Klodt, *Strategische Handels- und Industriepolitik. Theoretische Grundlagen, Branchenanalysen und wettbewerbspolitische Implikationen*, J. C. B. Mohr (Paul Siebeck), Tübingen 1992, p. 25).

is no reaction on the part of the government of the other country to the application of trade policy instrument by the government of the country where the headquarters of a competitive enterprise are located.

When export subsidy is applied in the model based on Cournot's quantitative competition such assumption seems to be particularly unrealistic because an enterprise of the country which does not take up any interventionist measures incurs losses due to the outflow of a part of the producer's rent. Implementation of export subsidy in international duopoly by the government of one of the countries is an action of beggar-thy-neighbour type which leads to reducing the level of welfare of the other country. Therefore, it should be expected that the government of this country will seriously consider the possibility of retaliatory, interventionist support for its enterprise

When export tax is imposed in the model based on behaviours according to Bertrand's price competition, a parallel application of the identical trade policy instrument by the other country is an immanent condition for both competing enterprises to obtain benefits. Therefore, in this model the essence and the effects of endogenous approach to retaliation should be understood in a completely different way.

2. Domestic rationality vs. international rationality in Brander-Spencer's model

2.1. The principle of retaliation – case of symmetrical enterprises

Model considerations of the reaction of the other country's government as a form of retaliatory behaviour towards the government of the country introducing export subsidy make it possible to treat the mutual behaviour of entities at the macro and microeconomic level on the oligopolistic market as a two stage game of uncooperative character. In the first phase of this game the governments establish the levels of subsidies for their own enterprises, treating the subsidy rate fixed by the other government as given; in the second phase each of the enterprises (domestic and foreign) determines its maximum supply of a given product, treating the subsidy received by a competitive firm as a given value. The enterprises behave according to Cournot's principles of quantitative competition.

The consequences of retaliatory application of export subsidy by the government of the other country can be observed in Fig 1. It shows interactions between entities in an international duopoly. The enterprises under consideration (domestic A and foreign B) are similar, with identical structure of costs. A consequence of such an assumption is a symmetrical character of the curves of reaction. As a result, under

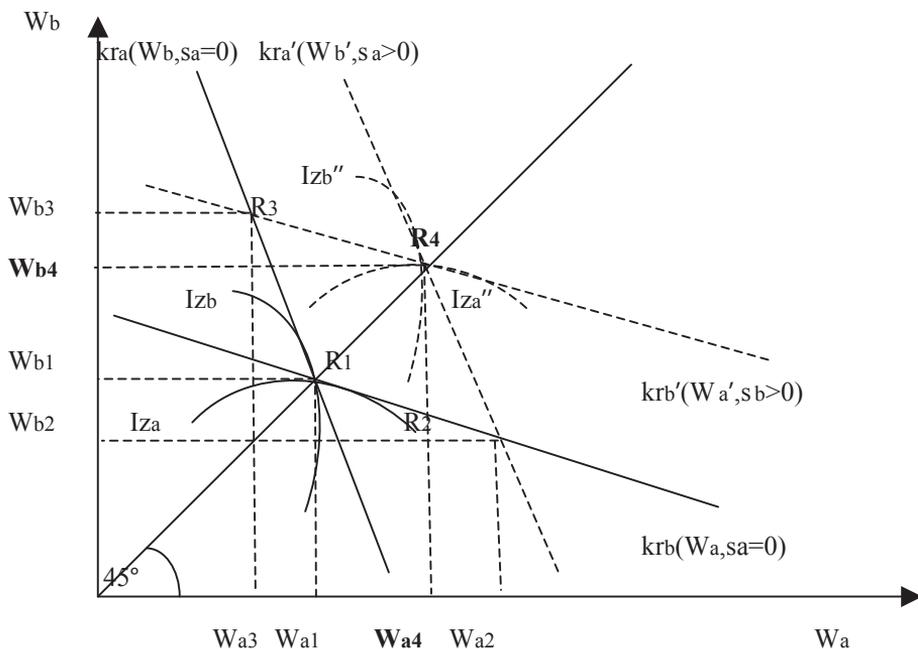


Figure 1. Interactions between entities in the model of strategic trade policy when retaliatory export subsidy is implemented (case of symmetrical enterprises)

Explanations: W_a, W_b – volume of production of homogeneous product in country A and B
 k_{ra}, k_{rb} – curves of reaction of enterprises in country A and B
 I_{za}, I_{zb} – isoquants of profit of enterprises in country A and B
 S_a, S_b – export subsidies for enterprises in country A and B

Source: Author's own materials based on H. Siebert, *Strategische Handelspolitik. Theoretische Ansätze und wirtschaftspolitische Empfehlungen*, "Aussenwirtschaft", 1988, Heft IV, p. 570

free trade, at the intersection of initial curves of reaction k_{ra} and k_{rb} , both enterprises manufacture equal quantities of homogeneous products ($W_{a1}=W_{b1}$), selling them on the market of the third country. At point R_1 Cournot–Nash equilibrium is reached. Equilibrium points R_2 and R_3 , which result from a one-sided shift outside the curves of reaction to position k_{ra}' and k_{rb}' respectively, resulting from an independent introduction of export subsidy by country A (R_2) and country B (R_3), determine the volumes of supply provided by each enterprise. Therefore, an increase in the supply of the commodity offered by a given enterprise takes place at the cost of decrease in the supply of the other enterprise. The shift in the volume of output of enterprise A from level W_{a1} to level W_{a2} due to export subsidy applied by the government country A causes the decline in the volume of output and sales of enterprise B from W_{b1} to W_{b2} at the point determined by R_2 . As a result, part of oligopolistic rent from abroad is transferred to country A and the welfare of this

country grows. A reverse result is observed as regards equilibrium point R3 which is accompanied by increased supply of enterprise B from level $Wb1$ to $Wb3$ with a simultaneous decline in the supply offer of enterprise A from $Wa1$ to $Wa3$. In this case the rent is shifted in the opposite direction to a foreign enterprise, thus influencing the growth of welfare in country B. In the situation under consideration where export subsidy is bilaterally applied in a non-cooperative game between the governments of both countries (the first phase) and between domestic and foreign enterprises (the second phase), a simultaneous shift of the curves of reaction to positions kra' and krb' determines a new Cournot-Nash equilibrium point denoted by R4. The volumes of output and sales of both enterprises ($Wa4$ and $Wb4$) resulting from this point are higher than they would be if both countries did not apply trade policy instruments ($Wa4 > Wa1$ and $Wb4 > Wb1$). The shift of oligopolistic rent (stimulating the growth of profit of one of the enterprises and the welfare of the country where it is based) is eliminated and on the market of the third country there appears a greater quantity of the commodities offered by both firms causing a decrease in their prices. As a result, with the assumption that the producer's rent is divided symmetrically, neither of the enterprises maximises its function of profit and each of the countries applying an instrument of trade policy suffers the loss in welfare as compared with the initial situation characterised by free trade. The fact that each of the enterprises competing in the duopoly simultaneously tries to increase its share in the oligopolistic producer's rent is responsible for the reduction in the sum of rents and so the profit per each firm must be smaller. Beneficiaries are consumers of the third country whose welfare indicates a growing tendency.

2.2. The principle of retaliation – case of non-symmetrical enterprises

The case presented above concerns the situation of similar enterprises – participants of the international duopoly – whose supply and producer's rent achieved were identical at the initial stage. The assumption that the structure of costs is similar and the share in producer's rent is symmetrical is of simplifying model character. Lifting this assumption makes it possible to investigate the effects of retaliation applied by one of the countries in response to the export subsidy introduced by the government of the other country (see Fig 2).

As in the base Brander – Spencer model of strategic trade policy, one assumes here the case of international duopoly with two enterprises (home enterprise A and foreign enterprise B) which manufacture homogenous goods, selling them on the market of the third country. In a two-stage game, in response to export subsidy (sa) introduced by country A a similar decision is taken by the government of country B (sb). In the next phase mutual strategic interactions occur between the enterprises participating in the duopoly. The firms behave according to Cournot's principles of quantitative competition, treating the assumed volumes of their rival's supply

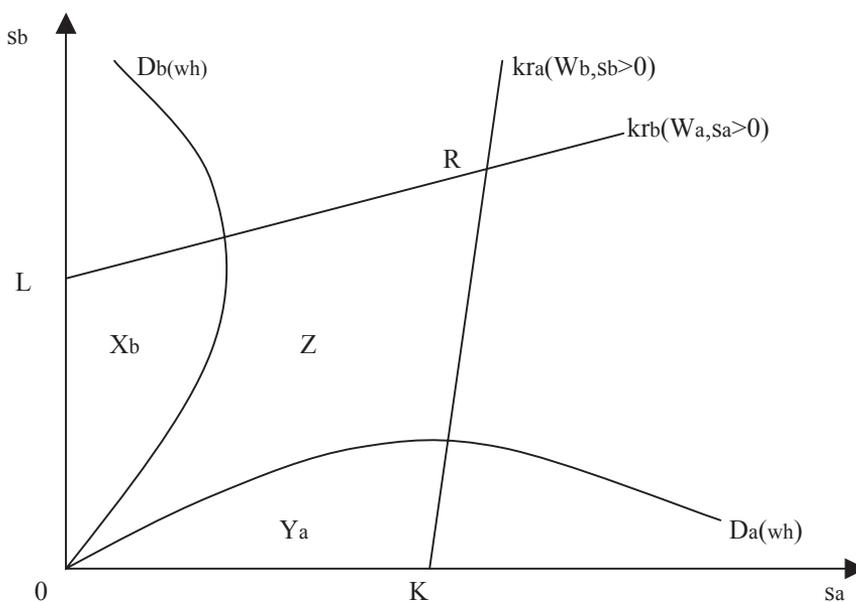


Figure 2. Consequences of retaliatory implementation of export subsidy in international duopoly (case of non-symmetrical enterprises)

Explanations: $D_a(wh)$, $D_b(wh)$ – isoquant of welfare in country A and country B under free trade

Y_a – area of higher benefits in the level of welfare in country A in comparison with free trade

Y_b – area of higher benefits in the level of welfare in country B in comparison with free trade

Other symbols – as in Fig. 1

Source: Based on K. Wong, *International Trade in Goods and Factor Mobility*, The MIT Press, Cambridge, Massachusetts, London 1997, p. 569

as a given magnitude. Nash equilibrium which takes into account the volumes of production offered by each of the enterprises is a function of the rates of subsidy s_a and s_b ⁷. The welfare of country A (D_a) and country B (D_b) is equal to the difference between profits obtained by enterprises A and B competing in the international duopoly and the cost of subsidy applied by the governments of both countries. As the profits obtained are the effect of the subsidies introduced, the level of welfare in each of the countries is a function of the subsidy rates applied. This kind of synthetic approach to the function of welfare results from adverse influence of the instrument of trade policy introduced by a given country on the welfare of the other country. Thus, the introduction of subsidy s_b by the government of country B for

⁷ Explanation of the consequences of retaliatory export subsidy when the assumption of absolute similarity of enterprises is rejected is given on the basis of K. Wong's approach (Comp. K. Wong, *International Trade in Goods and Factor Mobility*, The MIT Press, Cambridge, Massachusetts, London 1997, pp. 568-570).

its own enterprise whose aim is to increase its share in jointly generated producer's rent is harmful for the welfare of country A. Similarly, the welfare of country B is reduced due to the introduction of a subsidy instrument introduced by the government of country A which has an identical aim as regards its home enterprise.

Both isoquants of welfare under free trade ($Da(wh)$ and $Db(wh)$) go through the beginning of the system whose space is delineated by subsidies granted by country A and country B to their enterprises (sa and sb) (see Fig.2). The area below the line of equal welfare $Da(wh)$ and to the left of isoquant $Db(wh)$ means a possibility to achieve bigger benefits in the sphere of welfare as compared to its value obtained under free trade exchange. Analogically, the area above the line of equal welfare of country A ($Da(wh)$) and to the right of isoquant of country B ($Db(wh)$) delineates a correspondingly lower level of benefits obtained by each of the countries than in the case when no trade barriers are imposed. When taking into account the highest points on both isoquants, it is possible to mark the curves of reaction of country A (kra) and country B (krb) where subsidies applied by the government of the competing country are treated as given volumes (subsidy sa for country A and sb for country B). Points K and L marked at extreme points of both curves, respectively on the horizontal and vertical axes, reflect the situations when the government of a given country applies the optimum level of export subsidy while the government of the other country does not take up any action in this respect. Nash point of equilibrium (R) appears at the intersection of the curves of reaction. Introduction of export subsidy by one of the countries for the first time, followed by an identical retaliatory instrument strategic trade policy applied by the other country, can lead to consequences determined by an adequate shape of geometrical figure OLRK. When the lines of equal welfare of each country start from the beginning of the system and do not overlap⁸, the space in the figure under consideration can be divided into area denoted by symbols Xb , Xa and Z . Mutual shifts of the curves of reaction, dependent on the existing volumes of production and sales, on the producers' rents obtained and the volume of subsidies applied, can occur in a way which justifies shifting of the point of equilibrium within the space between areas Xb , Xa and Z . Analysing the theoretically possible positions of this point, undoubtedly there is no possibility that the situation of both countries using export subsidies could be more favourable as regards the level of welfare than under free trade. At least one of the countries would have to reduce its level of welfare when confronted with the initial situation where no instrument of trade policy is applied. Such a consequence for country A will occur when the point of equilibrium is placed in space Xb which means improvement in the level of welfare of country B as com-

⁸ According to K. Wong this reflects the fact that the firms competing in international duopoly for recipients in the third country-not co-operating with each other and not implementing any trade policy-lead to excessive supply and thus they do not maximize joint profit (See K. Wong, op. cit., pp. 568-569).

pared with free trade. A shift of this point to the space delineated by Ya indicates, in turn, the growth of welfare of country A with a simultaneous loss of welfare in country B. If point R is situated within space Z, as is shown in Fig. 2, both countries will experience losses in their welfare. The latter case is most probable because in practice the entities operating in a duopoly are similar rather than different as regards the volume and structure of the costs incurred⁹. Therefore, the consequences of retaliatory actions taken by one country against the other should lead to jointly incurred costs which are higher (due to the subsidies) than the profits of enterprises expected in result of their application. Export supply increases and the prices on the market of the third country decrease more than in the case of a unilateral application of subsidies by one of the countries. Then we deal with a situation when bilateral introduction of export subsidies does not determine the shift of rents between the countries where both enterprises operate but only triggers the growth of consumer's rent in the third country.

Defining the level of welfare in country A as Da , in country B as Db and taking into account the position of equilibrium points R in Fig. 1, it is possible to present their mutual relations in the following way:

$$Da(R2) > Da(R1) > Da(R4) > Da(R3), \quad (1)$$

$$Db(R3) > Db(R1) > Db(R4) > Db(R2). \quad (2)$$

For each of the countries most favourable situation is when export subsidy is applied unilaterally (position R2 for country A and position R3 for country B). However, when this instrument of trade policy is applied concurrently (in retaliation by one of the countries) the levels of welfare achieved are lower in both countries than they would be if there was no intervention in either of them ($Da(R4) < Da(R1)$ and $Db(R4) < Db(R1)$). As from the viewpoint of a single country intervention in trade policy is most favourable, each of them will opt for it¹⁰. In this way a conflict arises which in the theory of games is referred to as “a prisoner’s di-

⁹ In this situation it should be assumed that a definitely less competitive enterprise would be eliminated from the market earlier, before any mutual - connected with implementation of export subsidies-strategic interactions with the other member of a duopoly occurred and before the market changed into a monopoly.

¹⁰ The more so that between implementation of export subsidy by the country initiating trade war and a possible retaliatory implementation of the same or another effective instrument of trade policy by the country which imitates the behaviour of its competitor, a certain period of time passes enabling the initiator to gain benefits due to a partial shift of the duopolistic producer's rent. The influence of this time delay in implementation of retaliatory tariffs on the distribution of welfare between the competitors is indicated by L. D. Qiu in his article *Why Can't Countervailing Duties Deter Export Subsidization?*, “Journal of International Economics” 1995, vol. 39, pp. 249-272.

lemma”. Each of the countries becomes a “prisoner” of making decisions based on domestic rationality without taking into account the consequences of international character¹¹. A criterion of domination decides about implementing such a strategy by the governments of both countries. In result this leads to non-cooperative behaviours which are contradictory to rationality of strategic behaviour in a supranational sense. Therefore, they are not optimal according to Pareto closely related to group rationality. Application of the co-operation procedures based on rationality on the international scale would have to lead to bilateral resignation from export subsidies and the choice of free trade exchange (point R1). However, it should be pointed out that although making decisions on the basis of domestic rationality and choosing export subsidy bear the features of sub-optimality but, on the other hand, a possible resignation of the government of one country from its implementation puts it in the least favourable situation (position of point R2 for country A and position of point R3 for country B)¹². As a result the priority of individual rationality in strategic behaviours of countries and enterprises leads to a situation which in the international sense is unfavourable for both entities competing in a duopoly.

2.3. Possibilities of solving a “prisoner’s dilemma”

Disregarding the possibility of using retaliatory measures is one of the most significant charges against adequacy of the strategic trade policy base models which take into account strategic behaviour of enterprises based on the principles of Cournot’s quantitative competition. As has been proved above, when retaliatory export subsidy is introduced – in response to similar behaviour of the country competing in a duopoly – as a result the benefits from unilaterally implemented strategic trade policy are negated. Countries and enterprises, while accomplishing their function of aim which takes into account only their own welfare, lead in their mutual strategic behaviours to the point of equilibrium which is disadvantageous for all of them.

The problem of tension between domestic rationality and international rationality which occurs in strategic behaviours of the analysed countries originates from two basic assumptions. Firstly, in the models of strategic trade policy it is assumed that the participants play a one-off game and secondly, that the consequence of the function of aim accepted for each country is their non-cooperative behaviour.

¹¹ Tension between individual (domestic) rationality and group (international) rationality was first studied in the 1950s by H. G. Johnson, who analysed Cournot-Nash game between the two governments of the countries imposing optimum tariffs (See H. G. Johnson, *Optimum Tariffs and Retaliation*, “Review of Economic Studies” 1953-54, vol. 21, pp. 142-153).

¹² Therefore, although the level of welfare $Da,b(R4)$ results from a suboptimal solution in relation to the case $Da,b(R1)$ and $Da(R2)$ (enterprise A) and $Db(R3)$ (enterprise B), but from the viewpoint of individual domestic rationality of each country it is a more favourable solution. Positions $Da(R3)$ and $Db(R2)$ represent the lowest levels of welfare for those countries.

Practically, in international relations it is possible to neglect the first premise because decisions made in the sphere of trade policy cannot be considered in categories of a one-off game. In the course of time numerous and various decisions are made by the governments of the countries participating in the strategic game. Therefore, one cannot exclude the possibility of entire overhaul of the previously used instruments of trade, substituting them with other instruments or resigning from them altogether. In the convention of the theory of games one should try to solve the “prisoner’s dilemma” by modelling the duels with multiple repetition. In a multiple game taking up co-operative activities in the hope of achieving better results may prove to be favourable for each of the countries. In this game the most significant element is the participants’ awareness of its finite or infinite character. In the former case one should expect the result which is similar to the behaviours based on a one-off game. Each country is aware of the final character of the game within a given interval of time. Therefore, in their decisions, first of all they take into account a dominating strategy, assuming that if no other games are to be played, co-operative behaviour has no sense¹³. In the latter case the introduction of infinitely repeated games makes it possible to neglect the charge against the model of strategic trade policy which consists in the application of non-cooperative behaviours reducing its adequacy. When the governments of both countries have no knowledge as to which game will be the last one, the grounds for cooperative behaviours are created. Each of the governments has to anticipate that their countries will meet again in the future, competing with each other on the market, and therefore they have to consider the influence of their own behaviour on the future behaviour of the competitors.

In practice, when the games between the governments of the countries are repeated many times, more complicated situations may emerge which may exceptionally permit non-cooperative behaviour. One type of such behaviour is a strategy defined as a “tit for tat”¹⁴. In the initial phase the behaviours are of co-operative character, in the successive phases as well, until the other country takes up interventionist measures in the sphere of trade policy. Then, in response the other country will take up retaliatory measures. In the subsequent phases of mutual behaviour the game of co-operative type takes place again. A variety of such behaviour is a “tit for two tats” strategy, i.e. retaliatory reaction of the affected country only when its rival exhibits non-cooperative behaviour twice¹⁵. Another type of strategy

¹³ There appears the so-called domino effect-with the assumption of a multiple game, however of a finite number of moves, the chances for co-operation in subsequent phases of the game fall like domino cubes (Comp. P. D. Straffin, *Teoria gier*, Wydawnictwo Naukowe SCHOLAR, Warszawa 2001, p. 96). As a result un-cooperative behaviours appear at the very beginning of the strategic game between the government of both countries.

¹⁴ For more information on how this strategy functions in the theory of games see, among others, R. Axelrod, *The Evolution of Cooperation*, Basic Books, New York 1984.

¹⁵ J. A. Brander, *Rationales for Strategic...*, op. cit., p. 41.

is a “trigger” strategy where the competing countries co-operate until one of them introduces interventionist measures in the trade policy. At this moment non-cooperative game begins and is continued although it does not exclude the possibility of returning to mutual co-operation in the future¹⁶.

The possible behaviours of countries in repeated games presented above encounter significant difficulties when attempts are made to apply them in practice. A significant charge against a “tit for tat” strategy is a problem with identifying the side which initiates a non-cooperative strategy, i.e. with determining which policy is “tit” and which one is “tat”. For example, in the United States there are arguments that it is necessary to impose restriction on the goods imported from Japan in retaliation to Japanese restrictions on the export of American goods. Interpretation of the mutual trade relations, however, may be different from the point of view of Japan which may claim that its trade policy instruments are a response to the advantage of American firms gained due to their access to preferential military orders and to the fact that the American government supports research¹⁷. Moreover, in the real world, on imperfect markets as well, there are usually more than two players and taking retaliatory measures against one of the partners may involve unpredictable and unintended effects for other competitors. Finally, the interventionist measures applied by some countries are often hidden although in fact they directly concern international exchange. This involves, among others, different kinds of regulations as regards health or environmental standards as well as other non-tariff barriers which can bring about similar effects although they do not assume the form of a traditional instrument of trade policy.

It should be noted that any trade policy of any country, of bilateral character from the viewpoint of “a prisoner’s dilemma”, always functions in a multilateral environment of the binding rules, previously the GATT, and now the WTO¹⁸. It is the role of the latter organisation (defining the procedures in international relations and ensuring that they are abided by) can be an important basis for generating rational strategic behaviours (from the viewpoint of the world economy) in the sphere of trade policy. The World Trade Organisation would serve as a negotiating forum for international negotiations whose aim would be appropriate distributing of welfare between the parties and working out the mechanisms which would stimulate observance of the agreements reached; the WTO would also play the role of an entity gathering information on the behaviours of particular governments¹⁹.

¹⁶ Comp. T. L. Hungerford, *GATT: A Cooperative Equilibrium in a Noncooperative Trading Regime?*, “Journal of International Economics” 1991, vol. 31, pp. 357-369 and P. Welzel, *A Note on the Time Inconsistency of Strategic Trade Policy*, “Open Economies Review” 1992, vol. 3, pp. 203-214.

¹⁷ J. A. Brander, *Rationales for Strategic...*, op. cit., p. 42.

¹⁸ Ibidem.

¹⁹ P. Welzel, *Strategische Interaktion nationaler Handelspolitiken. Freies Spiel der Kräfte oder internationale Organisation?*, “Jahrbuch für Sozialwissenschaft” 1992, Bd. 43, s. 389).

In the initial phase the function of the international organisation would consist in working out the mechanisms which would facilitate distribution of welfare through negotiations between the governments and which would simultaneously guarantee implementation of the accepted solution in a repeated game of the participants' behaviours. Solutions of co-operative theory of games or theory of negotiations may prove to be useful here²⁰. Figure 3 presents possible principles of the distribution of welfare for the case of two countries. In the space delineated by the values of welfare in both countries (D_a and D_b) there appear possible and permissible solutions situated on the curve which determines only the effective (according to Pareto) points of the acceptable limit of negotiation.

Two extreme points R_3 and R_2 denote the cases of welfare distribution in a situation where each of the countries independently carries out its trade policy, introducing an appropriate instrument, e.g. export subsidy. In line with what has been said above, these are the most favourable solutions (from the viewpoint of each of

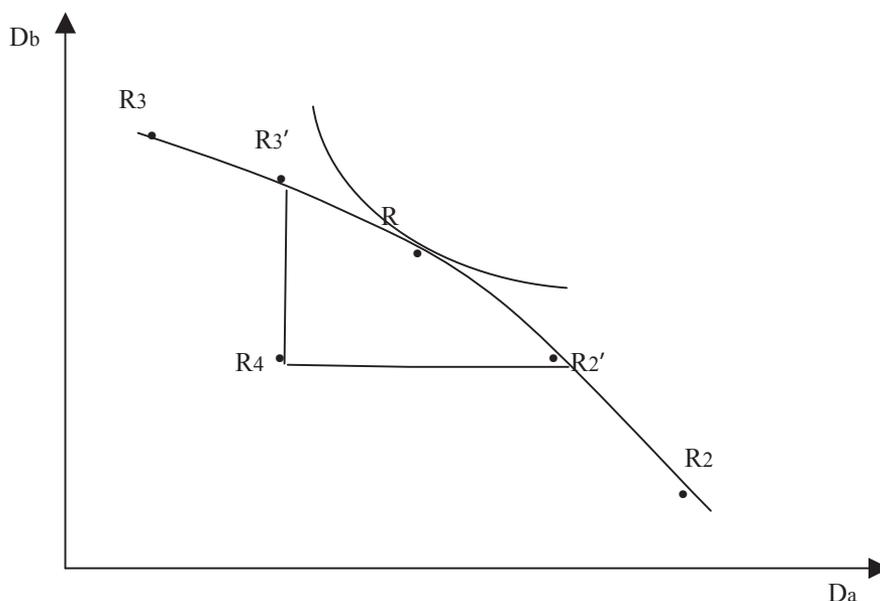


Figure 3. Distribution of welfare between countries

Explanations: D_a , D_b – welfare of country A and B
 R , R_1 , R_2 ... – points of equilibrium

Source: A.K. Dixit, *Strategic Aspects of Trade Policy*, in: *Advances in Economic Theory*, T. F. Bewley (ed.), Fifth World Congress, Cambridge 1987, pp. 329-362, after: P. Welzel, *Strategische Interaktion nationaler Handelspolitiken. Freies Spiel der Kräfte oder internationale Organisation?*, "Jahrbuch für Sozialwissenschaft" 1992, Bd. 43, p. 389

²⁰ Ibidem.

the countries) maximising their welfare but always obtained at the expense of the other country. Point R4 is the equilibrium point fixed in a situation when both countries carry out a trade policy simultaneously. Interactions connected with it are preceded by introduction of export subsidy by one of the countries. This makes it possible to shift the oligopolistic rent to one's own enterprise while the government of the other country whose aim is also to maximise welfare through increasing profits of its own firm, uses a retaliatory instrument of trade policy. In this way we arrive at the situation when the point of equilibrium is situated in the least favourable position as regards the levels of welfare of each country. Points R3 ' and R2' are extreme points of the section in which other points represent the possible – according to a Pareto optimality – conditions of negotiations on the distribution of welfare. Each of the points in this section fulfils the condition of a more favourable position – in comparison with point R4 – which indicates achieving better principles of welfare distribution than under retaliatory application of a trade policy instrument in response to its being implemented by the other participant of a competitive struggle. The exact place of the section R3' – R2' where the point determining the distribution of welfare between the countries will be found depends on the bargaining power of both partners. If point R is achieved in result of negotiations, a subsequent phase will be determination of adequate solutions which will make it possible to define strategic behaviours ensuring that the negotiated distribution of welfare is realised. Difficulties with defining such behaviours which lead to the distribution of welfare within the section R3' – R2'' pose a threat that negotiations will be broken and that both sides will choose non-cooperative solutions identified with the position of point R4.

Summing up the problem of sensitivity of the Brander-Spencer base model to the application of retaliatory practices on the part of the government of the other country, it can be stated that a threat to its adequacy results mainly from considering mutual interactions between enterprises only within the framework of a one-off game. If this is the case, introducing a retaliatory instrument by the government of the other country leads to the unsolved "prisoner's dilemma" i.e. the situation when each of the countries strives for maximizing its own welfare. This results in tension between rationality of individual behaviours and rationality of the behaviours which take into account the interests of the distribution of welfare on the international scale. In reality the introduction of co-operative behaviours which lead to the solution of the dilemma is possible because recurrent strategic interactions which take into account the future behaviour of a competing partner are permissible. However, these practices do not exclude the possibility of introducing strategic instruments trade policy at different stages of the competitive struggle according to Cournot type of behaviours. Even if in the long run there is a significant stimulus for co-operation between the competing countries, in the short periods there can appear premises for introducing a dominating strategy based on individual rationality. Therefore,

taking into account foreign retaliatory practices cannot be a sufficient premise to undermine the validity of the model of strategic trade policy which indicates the growth of welfare in the case of applying interventionist instruments.

3. Domestic rationality and international rationality in the Eaton-Grossman model

3.1. Interpretation of strategic behaviours under price competition

The behaviour of entities when strategic trade policy instruments are applied in the form of export tax can be presented on the example of the curves of their reaction (see Fig. 4). In contrast to a graphic presentation of strategic behaviours in the model based on quantitative competition, in this case the axes of the diagram determine the prices of goods offered by enterprises in country A and B (C_a and C_b) and therefore interpretation of the curves of reaction is different. These curves represent potential behaviours of the firms in the sphere of prices as a response to the level of prices offered by the competitor.

At point R1, called the Bertrand-Nash point, which is a place where both curves of reaction (k_{ra} and k_{rb}) intersect under the absence of trade barriers, international duopoly equilibrium is observed. Profit of the enterprise from country A is represented by isoquant (I_{za}) which is tangent to the curve of reaction (k_{ra}) at the duopoly equilibrium point. Positions of the curves of reaction show that the enterprise in country A can raise its profit only in the case of shifting along the curve of reaction of the enterprise in country B towards point R2 and reach the line of equal profit marked as I_{za}^{21} . This means not only a necessity to raise the price of own commodity from C_{a1} to C_{a2} , but also to convince country B enterprise about the necessity to raise the price for its commodity from C_{b1} to C_{b2} , i.e. to introduce an adequately higher price than under the Nash equilibrium. Otherwise a concentration of demand for a cheaper product from country B would occur.

The principles of behaviour according to Bertrand's price competition show that introducing export tax in one country may lead to profit maximization in both countries. In this way there occurs a phenomenon of gaining a simultaneous benefit by both enterprises, referred to as "rent procuring", absent in the case of "rent shifting" which was characteristic when export subsidy was applied under the Cournot's principles of quantitative competition. It should be pointed out that when the government does not intervene, raising the price of goods sold on the

²¹ This results from the fact that in the space delineated by both axes of price, both the curve of reaction of enterprise A and the curve of reaction of enterprise B move upwards.

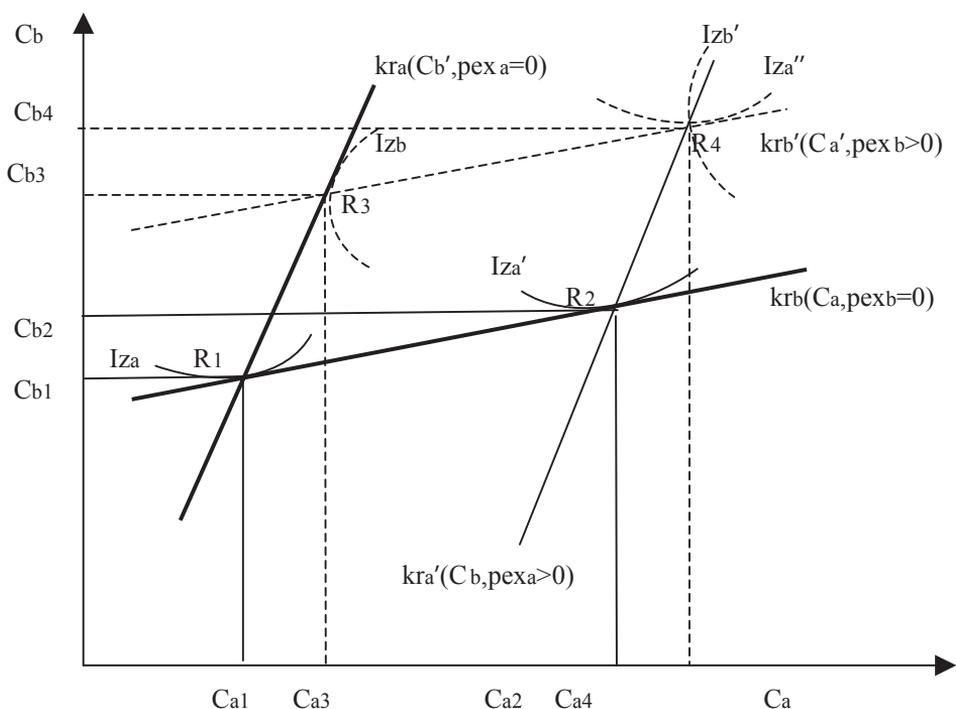


Figure 4. Interactions between entities in the model of strategic trade policy when export tax is imposed (behaviour according to Bertrand's price competition)

Explanations: C_a , C_b – prices of heterogeneous products offered by enterprise A and B
 k_{ra} , k_{rb} – curves of reaction of enterprises in country A and B
 I_{za} , I_{zb} – isoquants of profit of enterprises in country A and B
 p_{exa} , p_{exb} – export tax on products manufactured and sold by enterprise A and B

Source: Author's own materials based on: J. Eaton, G. M. Grossman, *Optimal Trade and Industrial Policy under Oligopoly*, in: *Imperfect Competition and International Trade*, The MIT Press, Cambridge, Massachusetts, London 1994, p. 128.

market of the third country by enterprise A might not be sufficiently credible for enterprise B to behave similarly and raise its prices as well. Enterprise B may suspect that the rise in price on the part of enterprise A is not permanent and a more favourable reaction would be to maintain the existing level of prices with a possibility to increase the volume of sales and gain more profit in this way. Only when the government of country A imposes export tax, the rise of prices will become credible and involve the reaction of the enterprise in country B. Fig. 4 shows that the introduction of export tax in country A results in a shift of the curve of reaction to position k_{ra}' . At the point of intersection with the curve of reaction of enterprise B (k_{rb}) a new point of equilibrium (R2) will emerge where due to price increase introduced by each of the enterprises (from C_{a1} to C_{a2} and from C_{b1} to C_{b2}

respectively) maximization of profit gained by both enterprises is observed. The optimum level of export tax corresponds with this point which is convergent with Stackelberg leader position.

A similar kind of reasoning might be done when country B enterprise is a price leader. Application of a strategic trade policy moves the curve of reaction of this enterprise to position krb' . At point R3 which is a point of intersection with a curve of reaction of the enterprise in country A (kra) and a tangent site with the line of equal profit Izb , profit maximization appears with price levels $Cb3$ and $Ca3$.

In result of applying export tax each of the countries where headquarters of both enterprises are located gains benefits. Due to deterioration in the terms of trade the consumer's rent in the third country decreases and therefore this country incurs losses. Thus the consequences are different from the behaviour according to principles of Cournot's quantitative competition and applying export subsidy. Welfare does not increase in result of shifting the monopoly rent between the countries whose enterprises participate in the strategic game but because the consumer's rent in the third country declines. Optimal intervention in an international duopoly according to Bertrand's types of behaviour is based on a silent co-operation of the trade policies of the countries-exporters. Restrictions on export of a given enterprise due to the rise in prices corresponds to cartel policy under which a competitive enterprise guarantees that it will not increase its supply on the market of the third country, creating for itself a space for increasing the price of its export offer, so that both enterprises can gain higher profits on this common market.

3.2. The principle of retaliation and the structure of dilemma between domestic rationality and international rationality in behaviours according to the rules of price competition and the rules of quantitative competition

When strategic trade policy based on Bertrand's principles of price competition is applied, there are no doubts as to the antagonism between domestic and international rationality which occur in a duopoly based on the principles of Cournot's quantitative competition. In this case there are no incentives for each of the countries to react at the same time in a way which is not convergent with a simultaneous maximization of welfare in both of them. A comparison between the effects of strategic behaviours under Bertrand's and Cournot's principles of competition is shown on a hypothetical example in Table 1. The Table presents effects of the combined application (by each country) of a free trade strategy or a strategic trade policy in the form of export tax (the case of Bertrand's price competition) or export subsidy (the case of Cournot's quantitative competition). When both countries resign from implementation of trade policy instruments (both in the case of Bertrand's and

Cournot's principles of competition) each country gains identical benefits (point R1 in Figures 1 and 4; case a): payment of 500 units for each of the players). The consequences are diametrically different when each of the countries tries to assume the function of Stackelberg leader and unilaterally apply a trade policy instrument (points R2 and R3 in Figures 1 and 4, case b) for country B and case c) for country A). According to the principles of Bertrand's price competition a unilateral introduction of export tax brings about less favourable effects for the country than in the case of functioning of free trade (750 units < 1000 units). The country which introduces this instrument for its products exported to the market of the third country thus causing price increases, reduces the competitiveness of its products in comparison with the commodities of the other country. Such a situation takes place because the other country does not have to raise its prices in the absence of an incentive, i.e. a trade instrument introduced by the other government.

The situation looks completely different when export subsidy is introduced under the principles of Cournot's quantitative competition. In this case country/enterprise

Table 1. Effects in the sphere of welfare in a hypothetical example of applying the theory of games in implementation of different instruments of strategic trade policy under Bertrand's price competition and Cournot's quantitative competition

Country A/ Enterprise A \ Country B/ Enterprise B	Free trade Bertrand (Cournot)	Export tax – Bertrand (Export subsidy – Cournot)
Free trade Bertrand (Cournot)	a) 500, 500 (500, 500) (R1)	b) 1000, 750 (250, 1000) (R2)
Export tax – Bertrand (Export subsidy – Cournot)	c) 750, 1000 (1000, 250) (R3)	d) 900, 900 (150, 150) (R4)

Source: Author's own materials.

A (case c) gains explicit advantage over country/enterprise B because at the end of mutual strategic interactions it is paid 1000 units while the competitor gets only 250 units. When enterprise B (case b) introduces a unilateral policy instrument, the effects are completely different. In the case represented in the Table by d) where a bilateral implementation of trade policy measures takes place, the consequences are considerably different. If Bertrand's principles of price competition are in for-

ce, each of the countries will benefit from a simultaneous introduction of export tax (point R4 in Figures 1 and 4). A loss will be incurred by the third country where both enterprises A and B export their commodities. The level of welfare of each country identified with the amount of payments reaches here 900 units. Therefore, the combined welfare of both countries exceeds the level of welfare under free trade (1800>1000). It is also higher than the sum of payments when one of the countries introduces export tax unilaterally (1800>1750). The distribution of welfare is different when competition between countries/enterprises takes place according to Cournot's principles of quantitative competition. In this case the previously discussed "prisoner's dilemma" occurs which finds its reflection in a rapid decline of payments to 150 units for each of the countries. This situation is definitely less favourable when compared not only with the case of a unilateral implementation of export subsidy (150 < 1000 or from the viewpoint of joint global welfare 300<1250) but also with the situation when no trade barriers are imposed (150< 500 or from the viewpoint of joint welfare on the international scale 300 < 1000).

If, as in the case of equations (1) and (2), symbols D_a and D_b stand for the level of welfare in country A and B respectively, and if the position of the points of equilibrium in Figure 4 as well as the results from the example presented in Table 1 are taken into account, then mutual relations between the consequences of implementation or resignation from export tax under price competition based on Bertrand's principles can be formulated in the following way:

$$D_a(R4) > D_a(R2) > D_a(R3) > D_a(R1), \quad (3)$$

$$D_b(R4) > D_b(R3) > D_b(R2) > D_b(R1). \quad (4)$$

The above-presented inequalities show explicitly that under price competition both entities of an international duopoly can lead to mutually beneficial arrangements in the sphere of trade policy interventionism. In this case each of the producers can maximize its profit due to implementation of export tax (on the heterogeneous goods manufactured) leading to the increase of price which is higher than the decline in the value of sales resulting from its lower volume. Thus, the "prisoner's dilemma" does not occur here; on the contrary, the incentive responsible for this problem under Cournot's competition, stimulating a unilateral implementation of trade policy instrument (advantage of the "first move"), under Bertrand's competition is substituted with an attempt to gain joint benefits and is not subject to Stackelberg leadership.

Therefore, here occurs a typical advantage from following the enterprise which is the first one to introduce the instrument of export tax because then the joint global welfare increases (benefit of "the second move").

However, it should be pointed out that although competition based on Bertrand's principles does not generate the dilemma, it poses a much bigger threat to the world free economy²². Although in the case of Cournot's type of competition there appeared a difficult to solve problem of reconciling domestic rationality with international rationality in strategic behaviours, but it is possible to solve if long-term perspective is applied and if in the convention of the theory of games recurrent scenarios of duels between the countries are taken into account. The possible sanctions, i.e. retaliation on the part of the other country, can be in this situation a significant barrier to a ruthless unilateral implementation of the instruments of strategic trade policy. In practice such sanctions do not appear when a model approach based on the principle of price competition is considered. In this situation there is no place for trade wars but there is much room for mutual price agreements of the cartel type which weaken free trade solutions as regards the common protectionist policy. In order to ensure global benefits taking into account not only the interests of the two countries/enterprises competing in an international duopoly but also the welfare of the third country, most exposed to losses, one should look for international regulations which ban this type of cartel agreements and apply adequate sanctions if they appear.

4. Conclusions

Base models of strategic trade policy rely on the principles of functioning of international duopoly taking into account either the rules of quantitative competition (Cournot) or price competition (Bertrand). These models contain a number of simplifying assumptions out of which the most significant is neglecting the possibility of implementation of retaliatory measures in the form of similar instruments of strategic trade policy by a country/headquarters of a competitive enterprise. Endogenous approach to the principle of retaliation involves completely different consequences for each of the two models under consideration, first of all because of the characteristics of strategic behaviours of entities resulting from the assumption of different rules of competition. In the case of quantitative competition, taken into account in Brander - Spencer model, in result of bilateral implementation of the instrument of strategic trade policy in the form of export subsidy contradictions emerge between domestic rationality and international rationality reflected in the so-called "prisoner's dilemma". There is no such antagonism in the principles of price competition which is a foundation for considerations in Eaton-Grossman model where implementation of export tax by one of the countries can genera-

²² D. Bender, *Neuere Entwicklungen der Theorie internationaler Handelsbeziehungen. Anstöße zur Neuorientierung der Handelspolitik?*, "Jahrbuch für Sozialwissenschaft 1994, Bd. 45, p. 40.

te benefits for both countries. A characteristics of strategic behaviours of entities in both cases shows that they realize the aim of maximization of profit and social welfare in a different way. In the model based on quantitative competition each of the countries tries to gain the benefit of “the first move” the consequence of which is the structure of dilemma. In the model based on the principles of price competition it is possible to obtain the benefit through following the behaviour of a price leader (the benefit of “the second move”). In this situation there is no contradiction between domestic rationality and international rationality.

The analysis of possibilities to solve the dilemma between the two types of rationality in Brander – Spencer model and the cause for its absence in Eaton – Grossman model leads, however, to surprising conclusions from the viewpoint of a long-term approach to the world economic welfare. “The prisoner’s dilemma” under quantitative competition can be solved if instead of a one-off strategic game between the entities a recurrent game, particularly of infinite character can be played. As a result one can expect that each of the entities will try to behave in a co-operative way, anticipating the possibility of retaliatory measures in response to non-cooperative behaviour. In this way contradictions which result from making decisions only on the basis of domestic rationality can be eliminated. On the other hand, in the model based on the principles of price competition there is no such contradiction, however, the willingness to co-operate can pose a much more serious threat to the world economy because both countries which benefit from price agreements are not interested in returning to the free trade economy.

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