A THEORATICAL CONSIDERATION ON TARIFFS, QUOTAS AND PARTNERSHIP GAME

Selahattin BEKMEZ(*)
Cem M. BAYDUR(**)

Özet: Makalemiz uluslar arası ticarete konu olan koruma duvarlarının etkilerini karşılaştırmakta ve bu koruma araçlarının hangisinin daha etkin sonuçlar verecegi konusunu oyun teorisi çerçevesinde incelemektedir. Modelimiz Copland vd. (1989) den yola çıkıp bu modeli iki ülkeli bir model olmaktan çıkarıp, n ülke için geçerli olacak şekilde genişletmiştir. Eger ülkeler stratejilerini "ortaklık (partnership) oyunu" çerçevesinde oluştururlarsa, ticaretten elde edecekleri kazanclar da onu göre daha yüksek olacaktır. Saf stratjilerin yanında karışık strateji oyunlarının da dikkate alınması bu kazancı daha artıracaktır. Makalemiz bu çerçevede pazarlık gücü oyununu analiz etmiş ve ilgili stratejileri teorik olarak tartışmıştır.

Anahtar Kelimeler: Tarife, kota, anlaşmalı oyun, karışık stratji, Nash dengesi

Abstract: In this paper we tried to analyze three country bargaining game, using Copland, Tower and Webb (1989) model in which they used two - country model. Our results proved that if two country act cooperatively, their bargaining power will be bigger, and they will extract some of the gains of country 1, which is relatively smaller. Country 1 prefers constrained quotas to constrained tarifffs. All countries prefer unconstrained tarifffs to constrained tarifffs while their ranking of the constrained versus unconstrained quota regimes depends on their relative bargaining power. In addition to pure strategy bargaining game, we also barrowed Copeland's (1989) model to show the implications of the mixed strategy Nash solution. If both trading partners do not use traditional protection tools separately, the Nash solution will also be different. Strategic solutions will be determined depending upon the bargaining powers of the trading partners.

Keywords: Tariff, quota, partnership game, mixed strategy, Nash solution

I.Introduction

Negotiations in lowering quantitative restrictions have become increasingly important as tariff-cutting negotiations in GATT succesfully bring in tariff rate reductions. Such negotiations become more important as tariffs become relatively less protective and absolutely most important as tariff reductions are sometimes offset by the introductions of quotas.

Rodriguez (1974) and Tower (1975) showed that a quota war leads to an absence of trade, so that in quota negatiations the threat point is the zero trade. The free trade point is the only Pareto optimal solution possible. They also showed that a quota war between two large countries leads asymptotically

(*) Doç.Dr. Muğla Üniversitesi İİBF İktisat Bölümü
(**) Doç.Dr. Muğla Üniversitesi İİBF İktisat Bölümü

to a state of autarky. However, a tariff war may or may not lead to results (Johnson, 1953 and 1954). The crucial point here is that unlike tariffs, with presence of quatas, the optimal response on a country by its tarding partner is always the imposition of more retrictive policy. In such a case, the effect of tariff and quota may not be the same.

Mayer (1981) showed that negotiations between two large countries result in a free tarde or the imposition of positive tariff by one country and a negative tariff by the other. However, unlike in tariff negotiations between two large countries, the nogotiation set shrinks to a single point corresponding to a free trade situation, which may not be in the tariff negotiation set. Mayer (1981) also demonstrated that if home country is relatively small, while the foreign county is large, the negotiation solution involves a positive tariff erected by the large country and negative tariff by small country, which has a different negotioation results. However, Webb (1984) extended these results for the assumption of a small home country with not binding optimal quota. Under this situation, the amount of foreign country quota does not matter at all. The large foreign county gains the most by imposing the optimal quota, while the home country does not restrict its trade. There is no point preferred by the foreign country to this combination of quotas, including the point that yields Pareto optimal fee trade.

Without loosing the generality of the concept, Chan (1988) used a different approach and analyzed the impact of negotiation outcomes due to different feasible utility payoff sets. When a country's tastes or endowment patterns are biased towards a single commodity or rely heavily on international exchange to improve utility, the negotiated outcome in two country Nash-Shapley bargaining famework generally benefits the opponent. He also noted the following conclussions: i) a larger or smaller diminishing rate of marginal utility of income for one country has no impact on the trading partner's gains ii) a cahange in tastes in favor of a county's abundant commodity, or an increase in the endowment of its scarce factor reduces the trade, and thus, lovers the trading partners' gain. iii) since consumption intensity does not affect the free trade solution, a change in tastes towards a more or less balanced pattern. Or a change in endowment, which alters the consumption intensity will have no impact at all, ceteris paribus.

Copeland (1989) analyzed the fact that most countries protect some industries with tarifffs, others with quotas, and still others with both tariffs and quotas. So, there is possibility that mixed strategy occurs in some cases. His main result was: no cooperative choice of quotas leads to the elimination of trade, as long as tariffs are set efficiently; and negotiations on either tariffs or quotas alone, while leaving the other instrument free to be chosen non-cooperatively yield essentially equıvalent results. So, he just extended the papers of Mayers (1981) and Webb (1984) by using mix (tariff and quota together) strategy. In contrast to Mayer and Webb, negotiations on either tarifffs

or quotas alone can not lead to free trade. Negotiations must take place on both instruments in order for that allocation to be feasible (Copeland, 1989).

For two large countries case, however, Tower et. al., (1989) found that if a strong bargaining affects a weak one, then the strong bargainer will prefer playing a game with qutas permitted, while the weak bargainer will prefer a tariff game with guotas outlawed. Also, very strong bargainer always strongly prefers the unconstrained tariff or quota game to its constrained counterpart, while very weak bargainers strongly prefer the constrined quota game to unconstrained counterpart, and weakly prefer the constrained tariff game to unconstrained couterpart.

While Rodriguez andTower analyzes that countries will agree to the rules that prohibit the use of quotas, Webb-Copeland (1989) found, in contrast, that when Nash bargaining solution characterizes the outcome of the second stage of protectionest game, a rule which prohibits quoatas will always be advantageous for one of players, because of redistribution of bargaining power. Thus, if the bargaining solution is obtained, countries will not, in general, unanimously adopt roles to prohibit quotas.

Along with above brief introduction, in this particular paper, we used Webb, Tower and Copeland (1989) model, and tried to use a similar metod for three country case, which can be extended to n country case. After summarizing their model, a new theoretical model has been developed to capture the results of negotiations. In this sense, an extended version of three-country model is used to make the model more realistic. In addition, we assumed that with the presence of partnership game, a three-country model would give more interesting results if at least two of them act cooperatively. Along with this, the games that produce a mixed strategy discussed and analized. The last section will summarize the concluding remarks of the paper.

II.Copeland-Tower - Webb Model

Copeland at al. (1989) extended the model constructed by Copeland (1989). This extention included additional assumption of the transfers to the model. They used Nash bargaining solution to investigate and compare different protection scenarios. Several combinations of three important instruments, (quotas, tarifffs, and transfers), are used for setting of trade barriers.

They began the analysis by using a standard trade indifference and offer curve techiques for a two-country-two-commodity model. In Figure 1, U_f and U_h indicate the utilities of the home and foreign country, respectively. The outcome of a tariff is indicated by point W. The curve QQ' in Figure 1 represents the utility possibility frontier for the case of unconstrained tarifffs or quotas. The curve Oqfq'O in Figure 1 represents production possibilities frontier (PPF) for constrained tarifffs or quotas. Point O represents a prohibitive tariff or quota by at least one country. If there is no protection, the equilibrium point moves clockwise to point f, which is a free trade level.

Now, we can use the diagram to illustrate the outcome of negotiation games. Although their main interest was to find out a comparison of pure tariff with quota regime in which threat points are at W and O, respectively, they discussed results of mixed tariff/quota regimes as well.

Possible set of negotiations differs depend upon policies used. For example, under constrained tariff policy, the negotiations set become tt'. However, if tarifffs are unconstrained, negotiations set become TT'. Under constrained quotas, the negotiations set is qq', and with unconstrained quotas the negotiations set becomes QQ'. In the mixed tariff and quota games, which have autarky as the threat point, the negotiations set is qq' for both constrained tariff and quota cases, and QQ' for unconstrained cases. As we can see negotiations sets are different, because the theart points differ across instruments.

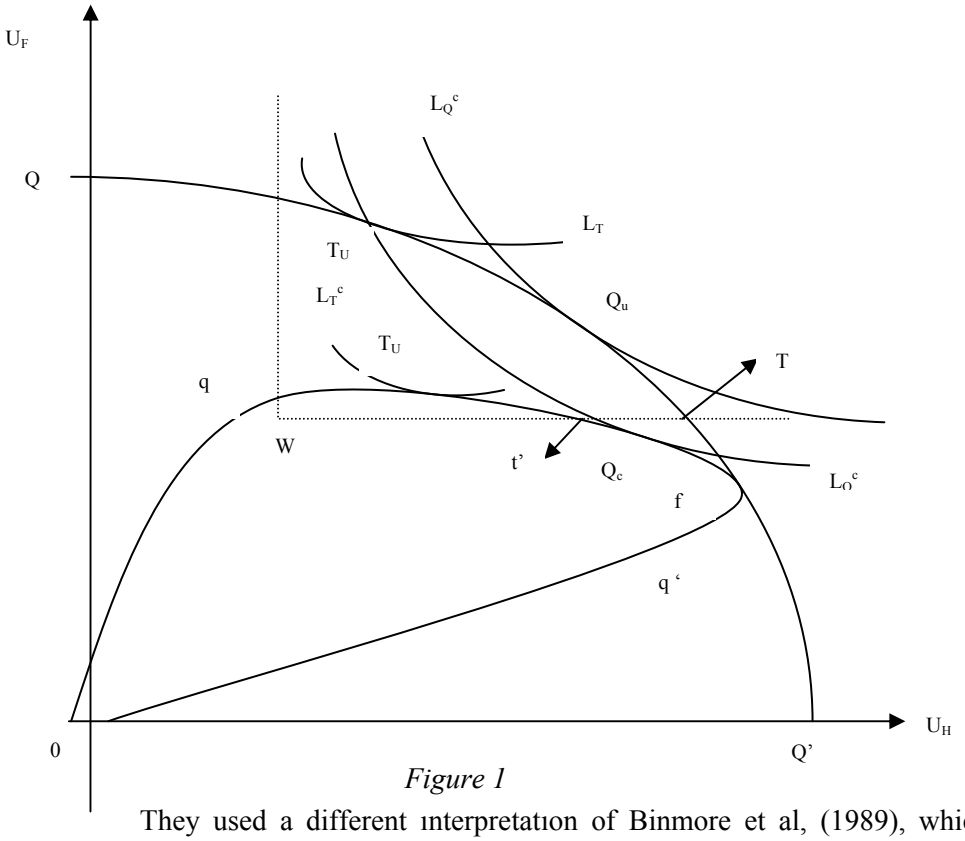

Figure 1

They used a different ınterpretatıon of Binmore et al, (1989), which shows that a Nash Bargaining solution approximates the outcome of an alternative offer non- cooperative bargaining game, in which there is some exogenous probabilities that negotiations will break down after each offer. With this approach, solution for a bargaining game can be approximately found by solving the following optimization problem:

$$Max(U^h - \underline{U}^h)^{\alpha}(U^f - \underline{U}^f)^{1-\alpha} \qquad (1)$$

where U^h and U^f are relevat threat points, and α is a measure of relative "bargaining strength" of the home country. Solution for this problem is illustrated in Figure 1. Level curves of maximand are denoted by L with subscripts T or Q, referring to the tariff and quota respectively, and superscripts *c* and *u* are referring to constrained and/or unconstrained tariff case, respectively. The solution for unconstrained tariff game is T^u, and T^c for contrained tariff case. For uncostrained and constrained quota game, the sulotions will be Q_u and Q_c, respectively. If the offer curves of two countries are symmetric, the equilibrum is at the free trade point, and thus, counties are indifferent between the tariff and quota regimes. If home country is a stronger bargainer than the foreign country, α increases. This steepens the level curves of the maximand. So, home country will be better in the quota game than in the tariff game.

A similar result holds for unconstrained games. So, unlike Rodrigez (1974) and Tower (1975), the solution in this model is: One country may find that the threat of quota use enhances its utility in a negotiated equilibrium, so that it would have no incentive to forswear the use of quotas. As can be seen in Figure 1, a sufficiently strong bargainer will always prefer an unconstrained quto game or vice versa. In other words, a sufficiently strong bargainer will prefer the unconstrained tariff game to the constrained tarifff game, while a week bargainer indifferent between the two. However, if the point W lains in the west of q and south of q', a sufficiently strong bargainer would always prefers the unconstrained tariff warfare game, while a sufficiently weak player would always prefers constrained tarifff warfare.

III. A Three Country Model

As summarized above, Copeland-Tower-Webb (1989) contructed a model with two countries in order to analyze the negotiations between them. We, however, extended this model to a three-county case, which also can further be extended to n country model. We will discuss the implications of a three-country model and leave the interpretation of n country model for the readers. In three-country model, the utility maximization equation can be expressed as follow:

$$Max(U_1 - \underline{U}_1)^{a1}(U_2 - \underline{U}_2)^{a2}(U_3 - \underline{U}_3)^{1-a1-a2} \qquad (2)$$

where *a* stands for bargainin power of the countries, and correspondig U's are relavent threat points.

The model we developed can be described as follow: Three large countries produce, consume, and trade N commodities. Aggregate production and trade in large country 1 is summarized by vectors of supply, demand, and excess demand functions. Large country i produces some subset of the N traded

commodities, taking prices, tecnology, and endwments as given in order to maximize profit. Aggregate supply is:

$$Y(P_f, Z_f).....,Y_n(P_f, Z_f) \quad (3)$$

where $P_f=(P_{fi},.....,P_{fn})$ is the vector of the producer prices of the N traded commodities, and Z_f is a vector of exogenous factors, such as prices of inputs and factor endowments.

Let demand function be:

$$X(P_c, Z_c) = (X_1(P_c; Z_c),....., X_n(P_{c;} Z_c)), \quad (4)$$

and corresponding utility function expressed as:

$$U(P_c; Z_c), \quad (4a)$$

where P_c is vector of consumer prices for the N commodities, and Z_c is a vector of exogenous variables. When it comes to selecting a policy choices, goverments consider the effects of their policies on the welfare of various groups, namely, producers and consumers. Assuming differentiability, the welfare associated with the integral line:

$$\prod_n (P_n) = \int_0^{P_n} P_n Y_n(p) dp \quad (5)$$

as commodities N is a net output or net input respectively.

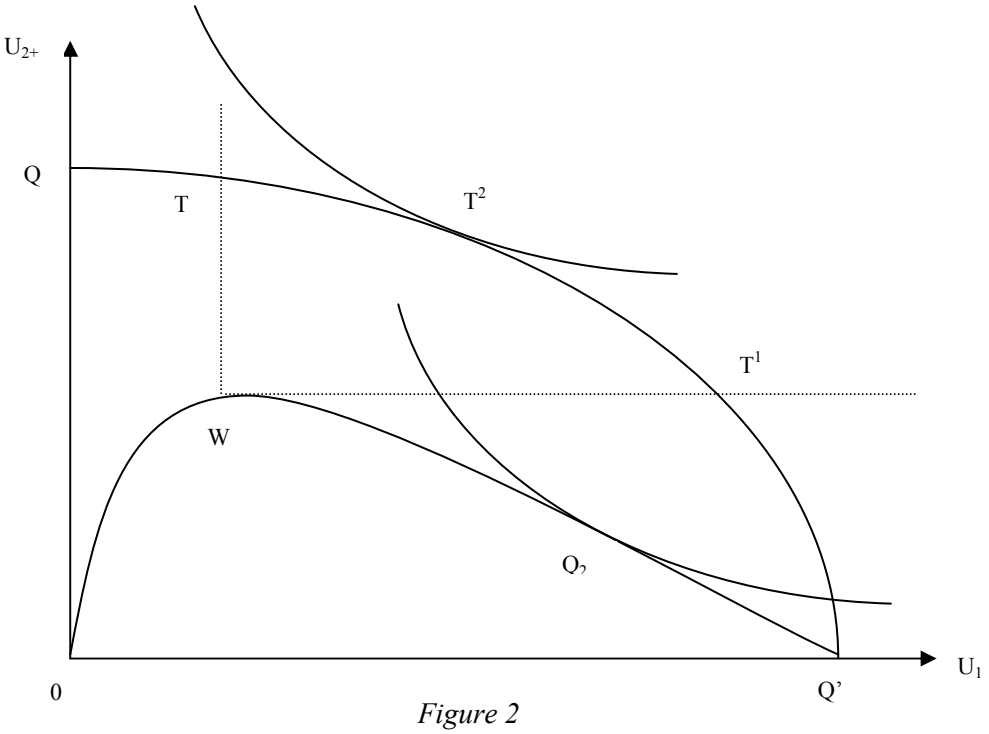

Figure 2

As shown in Mayer (1981) QQ' is Pareto frontier for unconstrained tarifff and quotas, and OWQ'O is the Pareto frontier for constrained tarifffs and quotas in Figure 2. The negotiations set is W in the constrained tariff case and segment TT' on the unconstrained tariff case. With quotas, the negotiations set in the constrained case is WQ' and it is QQ' in the unconstrained case. So, each country will be at least as well off under unconstrained tarifffs as under constrained tariffs (Copeland et al, 1989).

An important result from this outcome is that country 1 prefers the quota regime to the tariff regime, because the slope of utility possibilities curve at W is zero. Thus, point Q_2 will be always be to the right of W. Hence, country 1 always prefers quota game rather than tariff game. More obviously, country 1 has less (or no) power on its rivals in the tarifff regime. This result also has been shown in Mayer (1981). But if country 2 and 3 are sufficiently strong bargainers, they prefer unconstrained quota regime, since they can potentially extract all of country 1's gains from trade.

IV.Mixed Strategy Game

Various applications of the bargaining theory used by most countries can be experienced in real life. Instead of using only one pure strategy, countries use a mixed strategy to increase their bargaining power. The following section considers a mixed tariff/quota game in which players choose their tariff and quota levels non-cooperatively.(*)

A cooperative game set up has been shown in Figure 3. We assume that there are three countries in the game and two of which are acting cooperatively. Let's say, countries 2 and 3 are acting cooperatively. This implies that county 2 and 3 have symmetric information, while country 1 has asymmetric information. With presence of asymmetric information, all uncertainities of the game will be put on the sholders of the country 1. In other words, country 2 and 3 remove trade protections from each other, but impose more protections on country 1. If there are three equal size countries, and two of these countries act cooperatively, we can further assume that those countries which are acting cooperatively can be considered as one larger country. So, our game turns out to be one larger and one relatively smaller country game. They are, together, become relatively big country. Nash bargaining solution in the constrained tariff case is at W, and Q_2 in the constrained quota case. In literature this is called "partnership game."

Nash bargaining game proceeds as follow: As explained in Copeland (1989), country 1 determines its actions given the actions of cooperatively acting countries, country 2 and 3. Suppose t and Q represent a pair, where t is an

(*)Brain Copeland has discussed this issue in a very detailed way in his papers published in Journal of International Economics (1989), and Oxford Economic Papers (1989). Also, see R.E. Falvery (1985), and D.J. Horvell (1966) for more comprehensive results.

import tariff and Q is an import quota. Similarly country 1 also chooses a pair t* and Q*, which are tariffs and quotas, respectively. A Nash equilibrium will be obtained when each country's action is a best response to that of its trading partner, in this specific case, country 1 will be on one side, and country 2 and 3 are on the other side.

With the assumption of mixed strategy game, under quota game the Nash bargaining solution will be on G, but if there is no quata at all, this point will not be a Nash solution.

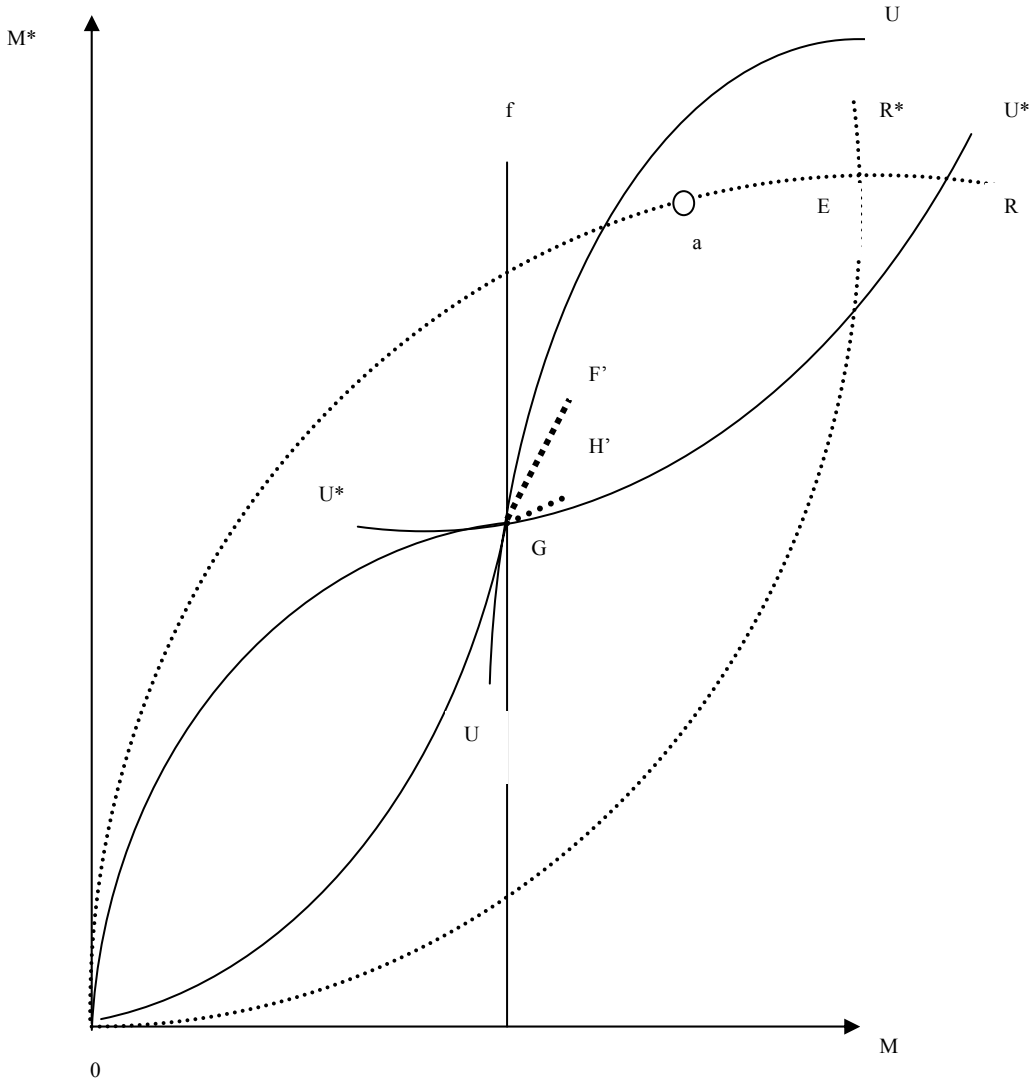

Figure 3

V. Concluding Remarks

In this paper we tried to analyze three country bargaining game, using Copland, Tower and Webb (1989) model in which they used two -country model. Our results proved that if two country act cooperatively, their bargaining power will be bigger, and they will extract some of the gains of country 1, which is relatively smaller. Country 1 prefers constrained quotas to constrained tarifffs. All countries prefer unconstrained tarifffs to constrained tarifffs while their ranking of the constrained versus unconstrained quota regimes depends on their relative bargaining power.

In addition to pure strategy bargaining game, we also barrowed Copeland's (1989) model to show the implications of the mixed strategy Nash solution. If both trading partners do not use traditional protection tools separately, the Nash solution will also be different. Strategic solutions will be determined depending upon the bargaining powers of the trading partners.

References

Bhagwati, Jagdish N, . (1968). "More on the equivalance of tarifffs and quotas". American Econumic Review, 142-227.

Binmore, K., Rubinstein, A., and Wolİnsky, A. (1989). "The nash bargaining solution in economic modelling," rand Journal of Economics, 17, 176-1888.

Copeland, B.R., (1989a). "Strategic interactionamong nations: Negotiable and non negotiable trade barriers", Canadian Journal of Economics.

.....(1989b), "Tariff and Quotas: Retaliation and Negotiation with two instruments of protection. Journal of International Economics, 180-188.

Copeland, B.R., Tower, E., Webb, M., (1989), "On the negotiated quotas, tarifffs, and transfers", Oxford Economic Paper, 774-788.

Folvey, R.E. (1985) "Quotas and Retaliation: A re-exemination", Economic Letters, 17, 373-377.

Gül, Faruk, (1989), "Bargain foundations of shapley value", Econometrica, vol.57, 81-95.

Horwell, D.J., (1966), " Optimal tariff and tariff policy", Review of Economic Studies, 147-158.

Johnson, H. G., (1954), "Optimum tariff and Retaliation", Review of Economic Studies, 142-153.

Mayer, M:, (1981), "Theoretical considerations of negotiated tariff adjusments", Oxford Economic Paper, 135-153.

Melvin, J.R., (1986), "The non equivalaence of tarifffs and import quotas", American Economic Review, 1131-1134.

Rodriguez, C., (1974), "The non equivalence of tarifffs and quatas under ritaliation", Journal of International Economics, 295-298.
Tower, E., (1975), "The optimum tariff and rtaliation", Review of Economics Studies, 623-630.
Webb, M., (1984), "A theorectial note on quota-reduction negotiations", Oxford Economics Papers, 288-290.