Retaliatory disagreement point with asymmetric countries. Evidence from European wine sector during enlargement

GENOVEVA ELENA PERJU

Abstract. The vector space model facilitates a very useful representation of the strategic interaction in trade because it is possible to incorporate both symmetric and asymmetric features of the players. This paper characterizes the Nash solution of the non-cooperative international trade game in the orthogonal vector space. We have used the standard properties of the Nash solution to determine if the non-cooperative action-reaction trade policy space should be written in terms of 'import-import' or 'import-export' quotas as strongest punishment. The trade policy space defined by 'import-export' quotas is not a Nash solution of the non-cooperative game but an improvement in the disagreement set. We show the positive correlation between import and export quotas using data on trade relations between EU-15, Romania, Hungary and Bulgaria for wine sector during 1993-2006. In our model the outcome of the non-cooperative trade is autarky. Retaliation is played when countries restrict their imports to one third of the national optimum.

JEL Classification: C72, F14, F51
Keywords: disagreement point, quotas, non-cooperative game, Nash solution
[1]

1. Introduction

In this paper we explain EU15-CEEC trade relations during 1993-2006 by employing the method of the reduction to the absurdity RA. The full concept of the paper is to make a supposition which is finally proved wrong. We suppose that a small country market may be used as outlet for dumping a large country's market surplus so that so that a trade policy space defined with import quotas restricting exports is a retaliatory stance between two countries of asymmetric market size. We prove the supposition wrong building up a model that accounts for the asymmetry of the partners while encompassing both conflict and cooperation features of the strategic interaction in trade. Conflict is reflected in the level of retaliatory market access modeled through the mean of quotas and the difference in market potential. Cooperation is induced through political negotiations for higher market access. In this way defined trade relations fit perfectly in the the governmental welfare function

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defined by Grossman&Helpman (1995)[2] which minimized independently provides the politically minimum retaliatory import quotas/exports in contrast with the common welfare governmental function which provides the politically acceptable level of import quotas/exports that both governments would agree on[3]. The effect of the internal political negotiations for higher market access are in the parameter attached to the national welfare which is higher the higher are the political pressures for exporting or more protection is need it. In line with the previous studies as well as the practice of trade liberalization, we study the strategic interaction in trade between CEEC-s and the European Union focusing on a single sector with the highest conflict potential. Three of the CEEC countries and the European Union are main wine producers in the world all sharing high exporting potential while EU is facing wine market surpluses administered even through distillation. Confronted with such situation it might be argued that the CEEC's markets could have been used as an outlet for European exports that coupled with a low market access of CEEC points at retaliatory trade relations.

Retaliation with both import and export quotas has been modeled by Towers (1974), Syropoulos, Dinopoulos and Kreinin (1995), Noritsugu Nakanishi (1999) but the outcome of the game is still controversial. Except Towers (1974) autarky was not found it to be the outcome of retaliatory game while Noritsugu Nakanishi (1999) suggested that the diversity of results might be due to the Nash equilibrium concept. In all cases retaliation is played with 'optimum quotas' which would maximize each country's welfare. Our contribution to the strand of research is to ensure that the retaliatory game is played starting out from the conflict point of the non-cooperative game in trade that is the point where each government minimizes the governametal welfare individually. We plot the disagreement point of the non-cooperative game within the topological space representing international trade and we show that the retaliatory policy space defined by 'import-export' quotas is not a Nash equilibrium of the game. For this we adopt Milner's (1988) argument that highly exporting firms are not likely to lobby for protection in fear of foreign retaliation even if the sector's import penetration ratio is high. Using the linkage between export dependence ratios, import penetration ratios and internal political pressures in CEEC's strategic trade relations with EU-15 for wine sector we show that exports do not carry a retaliatory conflict potential on the contrary, they are a better outcome of the strategic interaction in trade. The model is applied to the EU trade relations in wine sector with Romania, Bulgaria and Hungary which best exemplifies the evolution path from autarky, retaliation and cooperation using both restrictive import quotas and highly expansionist volumes of exports.In the next section we explicitly determine the Nash equilibrium of the retaliatory game with both import and export quotas as well as market asymmetries and we provide evidence that exports are an improvement from the

[2]The governmental welfare function is discussed in detail when we present the model.

[3]The common welfare governmental function is provided by Grossman, M. Gene and Helpman, Elhanan , *Trade wars and trade talks*, Journal of Political Economy, **1**03, 675-708, (1995)

worse outcome of the non-cooperative game. Stating out from retaliation we empirically show that negotiations have helped to increase the market access and to avoid the conflict triggered by a large difference in market potential. In Section 3 we illustrate the Nash behavior on trade relations between EU and CEEC's. Conclusions about the model and further directions of research are subject of the last section.

2. The Model

We model conflict in trade relations in international political economy fashion in a two countries two goods general equilibrium framework using the governmental welfare function introduced by Grossman and Helpman (1995), $G^C = C^C + a^C W^C$. Countries have similar political and economic structure. C^C is the lobby campaign contribution for setting up a quota while a^C is the value that the government attach to the national welfare, W^C . The lobby contributions and the value of the governmental weight is higher in exporting countries and lower in the importing ones. Governments count on rents and export licenses revenues in their welfare function. Each country exports one good and imports the foreign substitute. Production and consumption frontiers are continuous linear functions of price, $\mathbf{Y}^C = \alpha + \beta \mathbf{p}^C$, $\mathbf{Y}^C : \mathbb{R}_+ \to \mathbb{R}$ and respectively $\mathbf{X}^C = A - B\mathbf{p}^C$, $\mathbf{X}^C : \mathbb{R}_+ \to \mathbb{R}$ while $\mathbf{p}^C = (p_1, ..., p_j)$ is the price vector for $j = 1, ..., n$. The set of feasible consumption bundles $\mathbf{X}^C$ of the country C is the list $\left(X_1^C, X_2^C, ..., X_n^C\right)$ respectively $\mathbf{Y}^C = \left(Y_1^C, Y_2^C, ..., Y_n^C\right)$ for production, $\mathbf{Y}_j^C, \mathbf{X}_j^C \in \mathbb{R} \backslash \{0\}$ and$j = 1, ..., n$. We denote by $\mathbf{E}^C = \mathbf{Y}^C - \mathbf{X}^C$ one country's exports so that international trade is characterized by the one dimensional space $\mathbf{T}^1 = \{\mathbf{E}^C \left| \mathbf{E}^C = \mathbf{Y}^C - \mathbf{X}^C, \mathbf{Y}_j^C, \mathbf{X}_j^C \in \mathbb{R} \backslash \{0\}\right\}$. According to the definition of the topological space the additive inverse of $\mathbf{E}^C$ must be included in $\mathbf{T}^1$. Let $-\mathbf{E}^C$ be the additive inverse of $\mathbf{E}^C$ so that $\mathbf{I}^C = -\mathbf{E}^C = \mathbf{X}^C - \mathbf{Y}^C$ denotes country C imports. Thus the offer curve is allowed to bend back towards the axis representing imports so that Tower's restrictive assumption of elasticity of imports is eliminated. Geometrically, the space which contains one vector and its additive inverse is represented as follows,

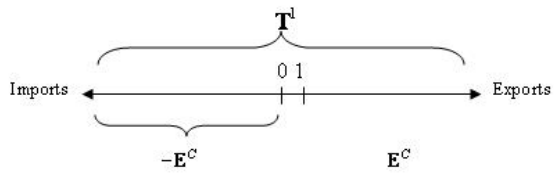

Figure 1. International Trade Space

In line with the usual approach in the literature we model trade interaction in the orthogonal space. At this point note that the one dimensional space $\mathbf{T}^1$ could be defined as either imports or exports. $\mathbf{T}^{\perp}$ is the orthogonal complement of $\mathbf{T}^1$ and a subspace of $\mathbb{R}$ therefore any subspace properties must hold. Similar to Cowell(2004):

1. Autarky

$\{0\} \in \mathbf{T}^{\perp}$

2. Asymmetries
   $\lambda \in \mathbb{N}, \mathbf{E}^C \in T^{\perp}$ implies $\lambda \mathbf{E}^C = \lambda\left(\mathbf{Y}^C - \mathbf{X}^C\right) = \lambda \mathbf{Y}^C - \lambda \mathbf{X}^C \in T^{\perp}$
3. Aggregate offers
   $\mathbf{E}^C, \lambda \mathbf{E}^C \in T^{\perp}$ implies $\mathbf{E}^C + \lambda \mathbf{E}^C \in T^{\perp}$

Therefore, the requirement that any linear transformation of exports is included in the international trade space ensures the possibility that both symmetric and asymmetric countries are modeled. The linear transformations of one country's production and consumption functions can be assigned to other countries to obtain a full range of asymmetric countries strategically interacting in trade. In this model the strategic interaction is limited to only two asymmetric countries. The non-cooperative game is played in the orthogonal space $\mathbf{D} \times \mathbf{D}^{\perp}$ where $\mathbf{D}^1$ is the retaliatory disagreement set of a small importing country while $\mathbf{D}^{\perp}$ is the retaliatory disagreement set of a large exporting country. The asymmetric structure of the game is ensured by $\mathbf{D}^1 \subset \left(\mathbf{D}^{\perp}\right)^{\perp}$ property of the orthogonal space. We define $\mathbf{D}^1 = \left\{\mathbf{I}^C \middle| \mathbf{I}^C = \mathbf{Y}^C - \mathbf{X}^C, \mathbf{Y}_j^C, \mathbf{X}_j^C \in \mathbb{R} \backslash \{0\}\right\}$ and $\mathbf{D}^{\perp} = \left\{\lambda \mathbf{E}^C \middle| \lambda \mathbf{E}^C = \lambda\left(\mathbf{X}^C - \mathbf{Y}^{\mathbf{C}}\right), \lambda, \mathbf{Y}_{\mathbf{j}}^{\mathbf{C}}, \mathbf{X}_{\mathbf{j}}^{\mathbf{C}} \in \mathbb{R} \backslash\right.$ where the asymmetry is provided by the value of the parameter λ which is a measure of the difference in market size between the trading partners.[4]

The outcome of the non-cooperative game is the disagreement point d^C, $d^C = \min_{\pm E^C} G^C$ where $G^C = C^C + a^C\left(\Pi^C + CS^C + Q^C\right)$, Π^C are the producers' profits, CS^C the consumers' surplus, Q^C are the gains from the quota rents and import licenses calculated as the product between the price differential and the volume of trade.

3. Retaliatory disagreement point

The strategic interaction between two countries Home(H) and Foreign(F), $C \in \{H, F\}$, is modeled in the space $\mathbf{D} \times \mathbf{D}^{\perp}$ where $\mathbf{D} \times \mathbf{D}^{\perp} = \left\{\left(\mathbf{I}^H, \mathbf{E}^F\right)\right|$ $\mathrm{I}^H \perp \mathbf{E}^F, \mathbf{I}^H \mathbf{E}^F, \mathbf{I}^H \in D^1, \mathbf{E}^F \in D^{\perp}$ } so that Home is small and Foreign is large. "Optimum quotas" are replaced by points where a quota would minimize each government's welfare function called retaliatory disagreement point (RDP) so that,

Lemma 1. *G^C is convex and increasing in $\left(\mathbf{d}^H, \mathbf{d}^F\right)$ while*
(RDP) $\left(\mathbf{d}^H, \mathbf{d}^F\right) = (1/3)\left(z^H \mathbf{Y}^H - t, -\left(z^F \mathbf{Y}^F + \lambda t\right)\right)$ for $(\forall)\, \lambda \in \mathbb{N}$ (1)

Proof. We determined the influence of the trade policy choice on the terms of trade using imports and exports definitions as follows (for comparative purposes see Bond and Park (2000)),
$\partial p^H / \partial I^H = -1/(B+\beta), \partial p^H / \partial E^F = -1/\lambda(B+\beta)$,
$\partial p^F / \partial E^F = 1/\lambda(B+\beta), \partial p^F / \partial I^H = 1/(B+\beta)$.

[4]Note that the sign difference ensures the use of an import quota by one country and of an export quota by the other while the parameter λ facilitates the modeling of the difference in market size.

In the spirit of the social welfare analysis by envelope theorem, Roy identity, Bernheim and Whinston "truthfulness" property and setting the first order condition equal to 0 (see Cadot, Melo, Olarreaga (2002)): $I^H = (+1/3)\left[z^H Y^H - t\right]$, $\mathrm{E}^F = (-1/3)\left[z^F Y^F + \lambda t\right]$ for $z = 1/a^C,\ t = (B+\beta)\left(p^F - p^H\right)$ $\square$

The retaliatory disagreement point $\left(\mathbf{d}^H, \mathbf{d}^F\right)$ is a Nash solution of the non-cooperative game if it satisfies the standard Nash axioms: symmetry (SYM), invariance (INV), independence of the irrelevant solutions (IIA) and Pareto optimality (PAR) while it is necessary to establish if the disagreement points are attained with import or export quotas.

(SYM) Since $\mathbf{E}^F \subset \mathbf{T}^{\perp}, \mathbf{I}^H \leqslant \mathbf{E}^F$ implies that the strategic interaction space $\mathbf{D} \times \mathbf{D}^{\perp}$ includes trade solutions which are the results of the non-cooperative trade interaction between:

a) Symmetric players if $\mathbf{I}^H = \mathbf{E}^F$ when $\lambda = 1,\ \mathbf{Y}^H = \mathbf{Y}^F,\ \chi^H = \chi^F,\ \mathbf{p}^H = \mathbf{p}^F$. The welfare weight is equal $a^H = a^F = a$. Countries are of equal size when $\lambda = 1$ so that they produce a comparable level of production denoted by $\mathbf{Y}^H$. Equation (1) writes,

$$(RDP)\left(\mathbf{d}^{H\prime}, \mathbf{d}^{F\prime}\right) = (1/3)\left(z^H \mathbf{Y}^H,\ -z^H \mathbf{Y}^H\right) (2)$$

Using the definition of the exports that was set up in the model, $-\mathbf{d}^{F\prime} = \mathbf{I}^F$. The retaliatory game is played at the disagreement point $\mathbf{d}^{F\prime}$ where Foreign sets an import quota representing one third from the level of production which is politically acceptable. Retaliation starts at the point where Home also sets an import quota. Therefore, the retaliatory disagreement set of the symmetric non-cooperative game writes,

$$\mathbf{D} \times \mathbf{D}^{\perp} = \left\{\left(\mathbf{d}^{H\prime}, -\mathbf{d}^{F\prime}\right) \middle| \mathbf{d}^{H\prime} = \mathbf{I}^H, -\mathbf{d}^{F\prime} = \mathbf{I}^F\right\} (3)$$

b) Asymmetric players if $\mathbf{I}^H < \mathbf{E}^F$ when $\lambda \in [1, \infty)$, $\mathbf{Y}^H < \mathbf{Y}^F, \chi^H < \chi^F,\ \mathbf{p}^H < \mathbf{p}^F$ and $a^F \neq a^H$. Equation (1) writes,

$$(RDP)\left(\mathbf{d}^{H\prime\prime}, \mathbf{d}^{F\prime\prime}\right) = (1/3)\left(z^H \mathbf{Y}^H - t, -\left(z^F \mathbf{Y}^F + \lambda t\right)\right) (4)$$

Foreign disagreement point is $-\mathbf{d}^{F\prime\prime} = \mathbf{I}^F$ so that retaliation is played with an import quota. However a similar conclusion is not straightforward for Home. Home's retaliatory point writes,

$$\mathbf{D} \times \mathbf{D}^{\perp} = \begin{cases} \left(\mathbf{d}^{H\prime\prime}, -\mathbf{d}^{F\prime\prime}\right) \left| \mathbf{d}^{H\prime\prime} = \mathbf{I}^H, -\mathbf{d}^{F\prime\prime} = \mathbf{I}^F \right. \text{ if } z^H \mathbf{Y}^H > t \\ \mathbf{0} \text{ if } z^H \mathbf{Y}^H = t \\ \left(-\mathbf{d}^{H\prime\prime}, -\mathbf{d}^{F\prime\prime}\right) \left| -\mathbf{d}^{H\prime\prime} = \mathbf{E}^H, -\mathbf{d}^{F\prime\prime} = \mathbf{I}^F \right. \text{ if } z^H \mathbf{Y}^H < t \end{cases} (5)$$

In expression (5), asymmetry in the non-cooperative problem extends the solutions set to the fourth quadrant of the orthogonal axes so that so that Home could retaliate with either an import or an export quota against an import quota set by Foreign.

Proposition 1. *Changing players identities changes the outcome of the game, therefore imports and export quotas cannot be at the same time a Nash equilibrium.*

Proposition 1 implies that one of the outcomes we should be concerned with is stability. At this point we have only one result which is stable for further analysis of EU15-CEEC trade relations. A retaliatory stance of a large exporting country is in fact an expansionist volume of exports protected with a tight import quota. For the small country, the increase in the market size seems to enlarge the range of policy options so that its retaliatory best response may be either an import quota or a retaliatory increase in the volume of exports or both. The next question is which on is the best response to the retaliatory stance of the large country, which one is retaliatory and moreover which one is stable across a full range of situations. Looking up at the result through the lances of the Nash equilibrium, if every partner seeks individually an equilibrium in trade relations the policy choice that brings retaliation has to follow the usual Nash properties. From all, Nash symmetry is the most worrying because when the retaliatory game is played with asymmetric players it should not be expected variations in the Nash equilibrium trade relations. Nash axioms imply that each player should know when a trading partner policy option is retaliation and which one is his best response to such situation. But proposition 1 implies that the standard symmetric property of the disagreement set is not verified. We could anticipate that either the 'import-import' or the 'import-export' retaliatory policy space is not a Nash solution of the game so that we check invariance (INV) property of the Nash equilibrium solution.

(INV) The affine transformation of the symmetric disagreement points is quite straightforward since the disagreement points of two symmetric countries $\left(\mathbf{d}^{H\prime}, \mathbf{d}^{F\prime}\right) = (1/3)\left(z^H\mathbf{Y}^H,\ -z^H\mathbf{Y}^H\right)$ fits perfectly in the affine form $m\mathbf{d}^C + n$ for $(\forall)\ m \in R_+,\ n \in R$. Suppose first that the retaliatory policy space is given by import quotas. By mean of transformation $m\mathbf{d}^C + n = mz^C\mathbf{Y}^C - m\lambda t + n,\ m \in R_+,\ n \in R$. Denoting $-m\lambda t + n$ by r , $mz^C\mathbf{Y}^C + r$ varies with $mz^C \in R_+, r \in R, \lambda \in \mathbb{N}$ following any affine transformation of the type $m\mathbf{d}^C + n$. If the retaliatory policy space is given by both import and export quotas then $m\mathbf{d}^C + n = -mz^C\mathbf{Y}^C - m\lambda t - n,\ m \in R_+,\ n \in R$. Denoting $-m\lambda t - n$ by r', $-mz^C\mathbf{Y}^C + r$ varies with $-mz^C \notin R_+, r' \in R, \lambda \in \mathbb{N}$. Export quotas do not follow the affine transformations of the retaliatory point.

Proposition 2. *The retaliatory policy space defined with 'import-export quotas' is not a Nash equilibrium of the retaliatory game.*

Indeed, invariance of the Nash solution is not verified if retaliation is played by the small country with an increased volume of exports in exchange of the large country exports. The next property of the Nash solution helps us to sort out the relevant solution of the game from the non-Nash solutions and it clearly delineates which policy option is of retaliatory type and what kind of response the governmental decedents should set out against the minimum retaliatory exports of the trading partner.

(IIA) We can define now the disagreement set of the non-cooperative game between two asymmetric countries as the convex set $\mathbf{D}^2 = \mathbf{D} \cap \mathbf{D}^{\perp}$ of retaliatory points. The previous axioms have already revealed a common point of the intersection set, namely the 'import-import' choice of the retaliatory policy

space so that any equilibrium solution must satisfy the inequality $z^H\mathbf{Y}^H < t$ in the equation (5).

The intersection set including the Nash solution for both Home and Foreign countries is the set of disagreement points,

$$\mathbf{D} \cap \mathbf{D}^{\perp} = \left\{ \left(\mathbf{d}^{H\prime\prime}, -\mathbf{d}^{F\prime\prime} \right) \middle| \mathbf{d}^{H\prime\prime} = \mathbf{I}^H, -\mathbf{d}^{F\prime\prime} = \mathbf{I}^F \right\} \quad (6)$$

The previous analysis yields the set of the irrelevant solutions of the non-cooperative game that is the retaliatory disagreement set, $\mathbf{IRR} = \mathbf{D}^2 \backslash \left(\mathbf{D} \cap \mathbf{D}^{\perp} \right)$.

$$(IRR)\ (1/3)(\mathbf{d}^{H\prime\prime}, \mathbf{d}^{F\prime\prime}) = \left(\mathbf{E}^H, \mathbf{I}^F \right) \quad (7)$$

A trade policy space defined by import and retaliatory export quotas is an irrelevant solution of the non-cooperative game.

Proposition 3. *A retaliatory policy space defined with both import and export quotas are an improvement from the disagreement set.*

This result can be justified and visually confirmed in the topological space of the international trade employing the next axiom of the Nash solution.

(PAR) Because of the induced asymmetry, we search those common disagreement points complying with the Nash solution properties. For this we compare the set of symmetric disagreement points with the asymmetric ones. In the equation (2) and (4), the import quota of the Home country declines by t in the asymmetric case as compared to the symmetry $d^{H\prime\prime} < d^{H\prime}$ so that we may consider the asymmetric set of disagreement points defined by imports quotas included in the symmetric set and $\mathbf{d}^{H\prime\prime} = (1/3)\left(z^H\mathbf{Y}^H - t \right)$ the Nash equilibrium solution of the non-cooperative game. According Olson (1965) there is less power of collusion in the large country so that $a^F < a^H$. We establish the inequality $z^F\mathbf{Y}^F + \lambda t > z^H\mathbf{Y}^H$ for $\lambda > \frac{z^H Y^H}{z^F Y^H + t}$ and we retain the asymmetric set of the disagreement points $\mathbf{d}^{F\prime\prime} = (1/3)\left(-z^H\mathbf{Y}^H - \lambda t \right)$ also defined by import quotas as the Nash equilibrium solution of the non-cooperative game in the Foreign country. The symmetric retaliatory disagreement point is

$$(SRDP)\left(\mathbf{d}^{H\prime\prime}, \mathbf{d}^{F\prime\prime} \right) = (1/3)\left(z^H\mathbf{Y}^H - t, -z^F\mathbf{Y}^F - \lambda t \right) \text{ for } z^H\mathbf{Y}^H > t \ , \lambda > \frac{z^H Y^H}{z^F Y^H + t} \quad (8)$$

Within equation (8), SRDP varies inversely related with t. A change in the parameters defining production and consumption function will determine proportional changes in both countries' prices therefore we can conclude that a country cannot be made better off without worsening the retaliatory partner. Increasing openness from one country won't deter its strategic partner from tightening its protectionist stance. The market size limit is a necessary condition for SDRP being Pareto improving and the change is less than proportional when $\lambda \in (1, \infty)$. In the figure 2 is depicted the Pareto frontier of $\mathbf{D}^2$.

The previous analysis reveals that the trade policy space defined with import quotas is the only Nash equilibrium of the retaliatory game between a large exporting country and a small importing one. From $\mathbf{I}^H \in \mathbf{T}^1, \mathbf{I}^F \in \mathbf{T}^{\perp}$ then $\left\langle \mathbf{I}^H, \mathbf{I}^F \right\rangle = 0 \Leftrightarrow I^H = 0$ or $I^F = 0$. In other words, at least one country chooses autarky as policy option. An export quota as retaliatory stance against

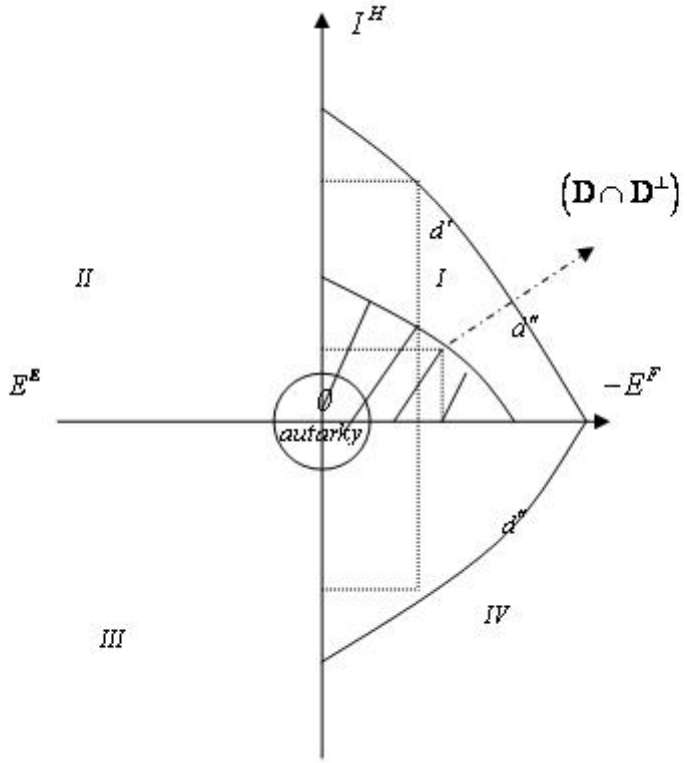

FIGURE 2. Retaliatory disagreement set

a large country import quota is a better outcome because it creates premises for better market access. The large country's exporters fear retaliation and the political pressure for protection decreases allowing a better market access for the small country exports. Therefore, *an import quota may increase at the same time with the volume of exports and the supposition in the introduction was wrong. (Q.E.D)* These findings explain why EU's exports on Central East European markets have been associated with enlargement instead of autarky in trade relations. In the next section we explore the type of impact of the wine market surplus on the retaliatory potential in trade relations with CEE countries and we further show the impact of the a varying political pressure through negotiations on the retaliatory stance providing empirical support to the claim that high volumes of exports are not deterring cooperation in trade relations.

4. Empirical analysis

4.1 Data and methodology

In this paper we have determined the retaliatory disagreement point in the space determined by the optimum import respectively export quotas or the importing and exporting needs calculated as the difference between the national

production and consumption potential. Export quotas are not retaliatory. Formally,

$$\begin{cases} \mathbf{d}^{H\prime\prime} = \mathbf{I}^{H} = (1/3)\left(z^{H}\mathbf{Y}^{H} - t\right) \\ \mathbf{d}^{F\prime\prime} = \mathbf{E}^{F} = -(1/3)\left(z^{F}\mathbf{Y}^{H} + \lambda t\right) \end{cases} \quad (9)$$

Substituting $d^{H\prime\prime}$ in $d^{F\prime\prime}$ through the mean of t, $I^{F} = \lambda\left[(1/3)\, z^{F}Y^{H} + (1/3)\, z^{H}Y^{H} - I^{H}\right]$ so that we have a formal expression for the retaliatory game,

$$I^{F} = \lambda(\,1/3)\mathbf{Y}^{H}(z^{F} + z^{H}) - \lambda I^{H} (10)$$

This is an equilibrium of the international trade which we estimate empirically with the following equation,

$$lnI^{F} = \beta_0 + \beta_1 lnI^{H} + \beta_2\ ln\ \lambda + \beta_3 lnz + \beta_4 ln\left(z * I^{H}\right) + \beta_5 ln\left(z * \lambda\right) + \beta_6(lnI^{H} * ln\lambda)(11)$$

where the analysis of the market size λ and political negotiations' impact z is related to the large country's retaliatory stance. The the dependent variable is each on his turn the large country's importing respectively exporting needs (optimum). The independent variable is small country's import respectively exporting needs when we control for the difference in market size λ and a dummy variable z for starting the enlargement negotiations.

The optimum trade flows as the difference between production and consumption have been previously estimated empirically by Baldwin (1971) through the vector of adjusted net exports[5] for the empirical test of Heckscher-Ohlin model. In our model the vector of optimal trade flows is similar but the empirical estimation cannot be made using adjusted net exports because in the data one country's imports are the other country's exports so that we cannot calculate the corresponding vector of adjusted net exports for the opposing player in the strategic interaction. We then compute the difference between production and consumption for optimum exports, respectively consumption minus production for optimum import quota. In Fig. 3 we plot adjusted net exports against the optimum trade flows of the small countries in the sample. The adjusted net exports representing the actual trade balance for wine is higher than the optimum trade flows so that if the model is verified empirically at the optimum will be valid at the actual higher volumes of adjusted net exports.

The dummy variable is used as a proxy for the parameter defining the internal political pressure and we model it as a qualitative variable interacting with each other variable defining the model. So that the rest of the variables capture the effects (β_4, β_5) of the interaction between the political option of being involved in negotiations or not on the retaliatory stance and the variables representing the difference in market size. The model is dependent also of the interaction (β_6) between the market size and retaliatory stance in trade.

We have collected data from California Wine Institute for the European Union's wine sector, the statistical compedium 'Global Wine markets: 1961-2003' and Eurostat. Our data covers a period of fourteen years between 1993

[5]Adjusted net exports have been defined as industry exports minus industry imports (Feenstra (2002)).

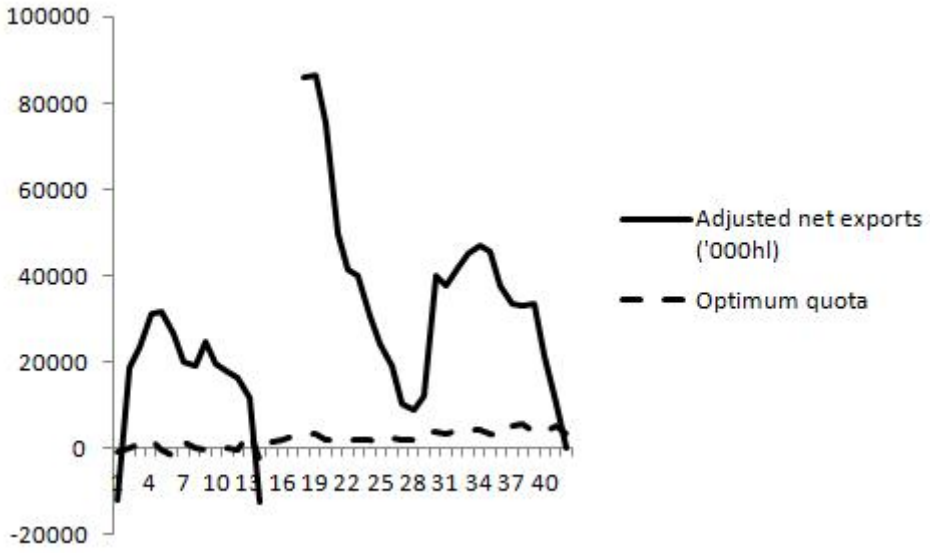

FIGURE 3. Bilateral trade Romania, Bulgaria and Hungary vs. EU15, UNComtrade

and 2006 for three countries (Romania, Hungary and Bulgaria) included in international statistics as main wine producers on the world market and at the same time trading partners for the EU-15, candidates to enlargement and involved in negotiations for trade liberalization.

No	Country	Average 2001-2003 ('000hl)	No	Country	Average 2001-2003 ('000hl)
1	France	50,034	11	Chile	5,988
2	Italy	46,994	12	Romania	5,269
3	Spain	35,274	13	Hungary	4,242
4	United States	24,249	14	Russia	4,007
5	Argentina	13,918	15	Greece	3,454
6	China	11,200	16	Brazil	2,933
7	Australia	10,683	17	Moldova	2,230
8	Germany	8,989	18	Austria	2,552
9	South Africa	7,504	19	Ukraine	2,197
10	Portugal	7,269	20	Bulgaria	2,185

TABLE 1. World hierarchy of wine producers, California Wine Institute

The choice of the countries is appropriate because 1993-2006 time span includes variability in the internal political pressure for trade openness. The countries have started enlargement negotiations at different points in time so that it should be possible to assess the impact of a lower political pressure after the opening of negotiations.

The model suggests that a) an increase in one's player import quota doesn't change the retaliatory stance of the opposing partner (-). Because of orthogonally, when the import quota is replaced by exports as dependent variable we expect the slopes to have opposite sign. As the model also suggests, b) the small country's retaliatory import quota increases to allow higher access for the large country's exports. (+)

Helen Milner (1988) analyzed extensively the linkage between the internal protectionist pressures and the import penetration respectively export dependence ratio. For the sample of data at hand, in Table 2 we show how Milner's conclusions that higher global interdependence trigger more trade openness may be applied for EU and Romania, Bulgaria and Hungary and why we expect statistically significant result for retaliation with exports being a better outcome for international trade relations.

	Import penetration 1995	Export dependence	Import penetration 2005	Export dependence
Romania	4.28	0.19	2.29	0.43
Bulgaria	24	0	6	0
Hungary	11.91	0.43	3.74	1.80

SOURCE: Author's calculations using UN Comtrade data

TABLE 2. 'Resisting protectionism' in Central East European Countries, 1995-2005

In 1995, five years after the collapse of the communist regime in Central East European countries, the economic reminiscences of the autarkic stance are still obvious. In the economic literature there is a broad consensus regarding the isolationist economic stance which has been a characteristic for the CEEC's economies during '80 and early '90. The data in the Table 2 gives us important information of what actually isolation meant. That is a) a low export dependence rate for all Eastern European countries in the sample and b) a high import penetration ratio for EU exports.

In 1995, we have calculated the retaliatory rates as being 0.23 in Romania, 1 in Bulgaria and 1 in Hungary. The import penetration ratios were higher than the retaliatory rates but European Unions has applied an import quota of 300,000 hectoliters representing an import penetration ratio of 0.04 for Romania, 0 for Bulgaria and 0.07 for Hungary which is less than 0.23 respectively

1 the retaliatory rates. We conclude that in 1995, trade relations between Romania, Bulgaria and Hungary and EU were retaliatory.

Agricultural negotiations have been opened with Hungary in 2000 and Romania and Bulgaria in 2002. In 2005, the retaliatory rates were 0.61 in Romania and 1 in Bulgaria respectively Hungary and import penetration ratios were higher than the retaliatory rates and in 2004 so that liberalization was achieved with all three countries in the sample. Not less important is the evolution towards balance between the import penetration ratios and export dependence. At optimum, they should be approximately equal and higher than the retaliatory rates. Table 2 depicts the most balanced situation for Hungary in 2005. Indeed, Hungary became a member of the European Union since May 2004.

4.2 Results and discussion

Previoulsy we have shown that the data sample fits the model which is tested empirically using the ordinary least squares estimation technique with panel data in STATA. The data has been scaled to measure the wine production respectively the wine consumption in 10000 ('000 hl) for the small country and 1000000hl ('000hl) for the large one. The difference in market size is considered both in terms of production as well as consumption. The dummy variable has been constructed assigning a 0 value for the periods when the countries were not involved in enlargement negotiations over the Agricultural Chapter and 1 starting with the year when the Agricultural Chapter has been opened for negotiation. One particular case is the one of Hungary who closed all negotiations in 2004 when it became a full member of the European Union so that we perform a sensitivity analysis estimating the model as if Hungary would still negotiate in 2004 and 2005 versus unbalanced panels with missing dummy variable for Hungary in the same period. The data was transformed into logarithms to ensure normality and hetroskedasticity. The plot of the natural logarithm of the large country's import quota against time indicates the existence of two outliers for Romania in 2005 and 2006 so that we reestimate the model excluding the outlier. Before proceeding with the analysis, the Hausman test for the suitability of fixed effects versus random effects for model estimation is performed. We obtain a very small Hausman statistic so that we proceed with the random effects model. In Model 1 we estimate the model using import quotas. In Model 2 we include optimum exports as independent variable to show orthogonality.

We have obtained the expected signs for the correlations. Indeed, under retaliation the increase of the large country quota won't deter the small country from tightening its retaliatory stance so that at least one country chooses autarky. To further understand why this result was possible consider that the large country accepts to decrease its exports and increases the import quota but the small country may chose to protect its infant industry for example. Countries choose opposite stance and trade liberalization is not possible. On

	Model 1	Model 2
Constant	1.219***	0.014*
	(0.105)	(0.008)
Ln Small country's import/export quota	-1.213***	1.419***
	(0.106)	(0.113)
Ln production differential	-0.434***	-0.718***
	(0.025)	(0.042)
Ln consumption differential	-0.021	0.202***
	(0.019)	(0.015)
A dummy for enlargement negotiations	0.190***	0.056
	(0.040)	(0.039)
Ln Small country's import/export quota*negotiations	-0.194***	-0.060
	(0.041)	(0.004)
Ln production differential*negotiations	0.0311**	0.008
	(0.016)	(0.015)
Ln consumption differential*negotiations	-0.028***	-0.006
	(0.014)	(0.013)
Ln production differential*Ln small country's import/export quota	0.262***	0.553***
	(0.021)	(0.040)
Ln consumption differential*Ln small country's import/export quota	0.192***	-0.040***
	(0.019)	(0.008)
Observations	42	42
R2	0.96	0.97

*p$\leq 0.10; **p \leq 0.05; ***p \leq 0.01$

TABLE 3. Empirical estimation of the retaliatory game

the contrary, expanding exports on competitive grounds as the large country increases trade openness benefits global trade.

Being involved in negotiations increases access to the large country's market. The interaction between the small country's import penetration ratio and the probability of being involved in negotiations is important because it assigns a 0 value to the small country's import quota when there are not negotiations versus the politically minimum import quota when there are trade liberalization negotiations. We have obtained a positive statistically significant coefficient which indicates that negotiations make a difference in retaliatory trade relations but doesn't move them away from autarky at least towards the Nash equilibrium of the non-cooperative game.

On the other side, production and consumption differential do make a positive impact on the retaliatory stance. Both their combined impact toghether

with the small country's import quota inscreases the large country's market access towards greater trade opening. In Model 2 it is possible to see the orthogoal relationship between retaliatory imports and retaliatory exports.

Next, we are concerned with the time impact in the cross-sectional data. The estimates of the equation (11) reflects a simultaneous moves game for choosing the retaliatory trade policy but we are concerned with the situation when time may have an impact.

	Model 3	Model 4	Model 5
Constant	1.216***	1.299***	0.895***
	(0.108)	(0.104)	(0.245)
Ln Small country's (SC) import quota	-1.228***	-1.218***	-0.417
	(0.112)	(0.106)	(0.555)
Ln production differential	-0.444***	-0.434***	-0.623***
	(0.026)	(0.025)	(0.131)
Ln consumption differential	-0.016	-0.012	0.130
	(0.020)	(0.019)	(0.105)
A dummy for enlargement negotiations	0.176***	0.165***	0.131**
	(0.040)	(0.039)	(0.056)
Ln Small country's import quota*negotiations	-0.181***	-0.169***	-0.136**
	(0.043)	(0.041)	(0.057)
Ln production differential*negotiations	0.029**	0.028**	0.020
	(0.0001)	(0.016)	(0.017)
Ln consumption differential*negotiations	-0.026*	-0.025**	-0.01
	(0.011)	(0.014)	(0.01)
Ln production differential*Ln SC import quota	0.271**	0.262***	0.456***
	(0.022)	(0.021)	(0.137)
Ln consumption differential*Ln SC import quota	0.187**	0.193***	0.034
	(0.019)	(0.018)	(0.109)
Lagged small country's import quota	0.018**		
	(0.009)		
Lagged production differential		-0.0006	
		(0.004)	
Lagged consumption differential		-0.011***	
		(0.004)	
Squared small country's import quota			-0.466
			(0.319)
Observations	39	39	42
R2	0.97	0.97	0.96

*p$\leq 0.10; **p \leq 0.05; ***p \leq 0.01$

TABLE 4. Time changes in the retaliatory game

In Model 3 we test time assumption including a lagged value of the small country's retaliatory imports. Time and delays might still be a concern for production because import quotas are established yearly based on the previous year production potential and the next year's forecast so that in Model 3 estimates the retaliatory equation including a lagged value of the difference in market potential as regressor. In Model 5 we include the squared regressor for the small country's retaliatory imports to check the linearity in the model.

We have found a negative statistically significant value for the lagged value of the current period import quota of the small country. The retaliatory game is overall significantly influenced by the change in production differential between countries. Taking into consideration the past and present values of the market size differences the retaliatory game is not significantly altered while the linearity of the model is also verified.

Trefler (1993) estimated the endogenous protection for US using data on non tariff barriers from United Nations Conference on Trade and Development (UNCTAD) using an extensive list of regressors to capture the free-rider problem of the lobby coordination. A likelihood ratio test shows that the comparative advantage regressors given by the import penetration ratio, the change in import penetration of the following year as compared with the previous and exports are the most significant in the regression. There is not a statistically significant parameter for the import penetration ratio but for the change in import penetration over the subsequent years. We are again concerned with the robustness of our results at 'time impact' so that as in Trefler (1993) we estimate the change of the large country's import quota against a yearly change in the retaliatory stance of the small country. We create a new regressor to estimate the yearly change in the small country's retaliatory stance given the change in the retaliatory import quota of the large country. We estimate the model including the retaliatory imports change in Model 6 as well as prduction and consumption differential change. Similar to Trefler (1993) and in accord with our simultaneous moves game assumption, we show that the results are robust to a change in the method of estimation. In model 7 we use simultaneous equations method.

	Model 6	Model 7
Constant	1.214***	1.219***
	(0.105)	(0.105)
Ln Small country's import quota	-1.203***	-1.213***
	(0.108)	(0.106)
Ln production differential	-0.433***	-0.434***
	(0.025)	(0.025)
Ln consumption differential	-0.013	-0.021
	(0.019)	(0.019)
A dummy for enlargement negotiations	0.166***	0.190***
	(0.039)	(0.040)
Ln Small country's import quota*negotiations	-0.170***	0.194***
	(0.041)	(0.041)
Ln production differential*negotiations	0.027*	0.434***
	(0.016)	(0.025)
Ln consumption differential*negotiations	-0.024*	-0.021
	(0.014) (0.019)	
Ln production differential*Ln SC import quota	0.263***	0.262***
	(0.021)	(0.021)
Ln consumption differential*Ln SC import quota	0.193***	0.192***
	(0.019)	(0.019)
Yearly change in SC quota	-0.019	
	(0.021)	
Lagged small country's import quota	omitted	
Yearly change in production differetntial	-0.007	
	(0.008)	
Yearly change in consumption differential	-0.004	
	(0.008)	
Lagged production differential	omitted	
Lagged consumption differential	omitted	
Observations	39	39
R2	0.97	0.97

*p$\leq 0.10; **p \leq 0.05; ***p \leq 0.01$

TABLE 5. Trefler's change in import penetration and the relation with the retaliatory game

Unlike Trefler (1993) we did not find a statistically significant coefficient for the yearly change in the retaliatory volume of imports. The estimated results are robust to any change in time and simultaneous equations estimation reinforces the previous analysis. We have found an orthogonal relationship

between the lagged values of the protectionist stances in trade and production potential and the yearly changes. Neither of them is statistically significant.

Finally, the already mentioned sensitivity analysis with unbalanced panels and sensitivity to outliers is performed in Model 9 respectively Model 10.

	Model 8	Model 9
Constant	-1.200***	-1.402***
	(0.103)	(0.115)
Ln Small country's import quota	-1.194***	-1.402***
	(0.104)	(0.117)
Ln production differential	-0.435***	-0.525***
	(0.025)	(0.058)
Ln consumption differential	-0.014	-0.012
	(0.018)	(0.033)
A dummy for enlargement negotiations	0.182***	0.060
	(0.039)	(0.0406)
Ln Small country's import quota*negotiations	-0.190***	0.064
	(0.040)	(0.048)
Ln production differential*negotiations	0.031**	0.434***
	(0.015)	(0.025)
Ln consumption differential*negotiations	-0.028**	0.009
	(0.014)	(0.014)
Ln production differential*Ln SC import quota	0.263***	0.349***
	(0.021)	(0.056)
Ln consumption differential*Ln SC import quota	0.185***	0.164***
	(0.019)	(0.115)
Observations	39	37
R2	0.96	0.97

*p$\leq 0.10; **p \leq 0.05; ***p \leq 0.01$

TABLE 6. Sensitivity analysis of the retaliatory game

We have found strong evidence that the retaliatory stance in trade is influence by the size of the countries. The sign of the coefficient defining the retaliatory protectionist stance of the opposing partner is the one suggested by the model however its statistical significance is sensitive to changes in the data sample. Enlargement negotiations do not have the same influnce on retaliatory stance. One limitation of the estimation is the small sample size so that we cannot proceed with a more extensive analysis of sample variations.

5. Conclusion

We have shown that a retaliatory policy space defined with 'import-export' quotas is not a Nash equilibrium of the non-cooperative game. The vector space model facilitates a very useful representation of the strategic interaction in trade because it is possible to incorporate both symmetric and asymmetric features of the players. In our model the outcome of the non-cooperative trade game is autarky but despite our autarky result of retaliation we would advise cautiousness in making it general. The result is dependent on the orthogonality of the vector space which defines international trade. An extension of the paper is to reconsider retaliation in an extended vector space by removing orthogonality. Our results throw a shed of light on retaliation in trade relations. For policy making, the model is important because it specifically determines how much should be restricted the volume of imports for retaliation to start, namely 1/3 from the politically minimum optimum quota. Exports being a better outcome of the retaliatory game explains why EU15-CEEC liberalization has been possible despite the expansionist volumes of exports on both sides. Increasing the market size and negotiations benefits trade.

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