How much do non-tariff measures explain the border effect at entry to the EU market? The CEECs agri-food exports to EU in the pre-accession period.

Emmanuelle Chevassus-Lozza*, Karine Latouche*, Darja Majkovic**

*INRA UR 1134, LERECO, Rue de la Géraudière, BP 71627, 44 316 Nantes cedex 3, chevassu@nantes.inra.fr, latouche@nantes.inra.fr

** University of Maribor, Faculty of agriculture, Vrbanska 30, Maribor, Slovenia slovenia 2000, darja.majkovic@uni-mb.si

Paper linked to a selected poster prepared for presentation at the American Agricultural Economics Association Annual meeting, Portland, OR, July 29-August 1, 2007

How much do non-tariff measures explain the border effect at entry to the EU market? The CEECs agri-food exports to EU in the pre-accession period.[i]

Keywords: Eastern EU Enlargements, Gravity equation, Border effect, Tariffs and NTBs, trade resistance, agri-food products

I. Introduction

Since the Single European Market (SEM) has been established, the free movement of goods has been facilitated not only by removing border formalities, but also by the technical harmonisation of national legislation of each member state. For the agri-food sector a particular concern is to guarantee the safety and integrity of products. In this respect, the European Commission has developed a stringent policy regarding food safety and consumer information. Hence, strict regulation is imposed for all agri-food products commercialized in the SEM, whether of European or third country provenance. In the case of EU enlargement, accession to the SEM is conditional upon the candidate countries accepting the obligations of the internal market, and therefore accepting these principles of free trade. Fulfilling the requirements for EU accession means for the acceding countries not only costs related to adjustments of their production technologies in order to be consistent with the *acquis communautaire, but* also benefits. First, there will occur qualitative gains for citizens, through the improvement of the food safety and of the quality of life. Second, there will be measurable gains for the new member states (NMS), that should benefit both from the abolishment of the tariff barriers and the likely reduction of transaction costs resulting from the adoption of the European standards.

In this context, the aim of this paper is to assess the impact of trade barriers on agri-food exports from Central and Eastern European Countries (CEECs) towards the EU on the eve of their integration. Does the abolition of tariffs and the implementation of the *acquis communautaire* mean that these countries enjoy equal access to the European markets as the old EU members do, or are they still in the same situation in terms of market access as any other third country? To answer these questions, the *border effect methodology* initiated by McCallum (1995) and subsequently widely employed (see among others Chen, 2004; Mayer and Zignago, 2005) is used in order to analyse the impact of national

borders on trade. More precisely, the principle of the analysis is extended from national borders to the external frontiers of the European Union, by assuming that the SEM is an integrated area where barriers to trade are low. In other words, the aim of the paper is to measure the impact of EU borders (called hereafter border effect) and to assess the role tariff and non-tariff measures play in explaining this effect. Hence, just prior to joining the SEM, do NMS still face a border effect at entry to the EU market? Has this effect been reduced over the period of preparation for enlargement?

To answer these questions, a gravity model defined at a highly disaggregated level is used. The theoretical foundation of our gravity equation is provided by the work of Anderson and van Wincoop (2003) who analysed trade resistances between partners. In addition to classical determinants, our model includes specific variables for trade barriers as tariff and non-tariff measures. More precisely, concerning non-tariff measures, European standards regulating the entry of products into the European market are studied, either technical measures to ensure products meet quality requirements (e.g labelling standards) or measures to protect consumers or herds (e.g sanitary and phytosanitary standards).

The model is applied to agri-food imports of the EU15 (intra and extra EU imports) and estimated for two years: firstly 1999, when despite the Europe Agreements, the liberalization of agri-food trade between CEECs8 and the EU was at an infant stage (before the 2000 'zero-zero' agreements), , and secondly 2004 – the year of actual enlargement. In this year, after the 1st May, tariff protection vis-à-vis NMS was abolished, which should lead to a reduced border effect. The comparison between the two years may highlight the role *acquis communautaire* had on trade during the pre-accession period. Finally, among the CEECs, EU market access of the recent new member states – called hereafter NMS or CEECs8 – (Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Slovenia) is compared to that of the two forthcoming members – called hereafter Acceding countries (AC) – Romania and Bulgaria.

The paper proceeds as follows. The next section goes over recent trade developments and the main policy instruments for trade between the EU and CEECs. The model used in the empirical part of the paper is then described. Data and model variables are then reviewed. The results are discussed, then conclusions drawn in the final section.

II. The measurement of border effect (trade resistance): from the theoretical framework to the empirical assessment

Although there is a wealth of articles evaluating the impact of enlargement on trade, few studies focus specifically on the tariff and non-tariff impact that enlargement of the single market can have on trade. See for example articles by Manchin *et al.* (2003), Nahuis (2004). Using gravity modelling, they have estimated the significance border effects have for trade between NMSs and the EU. Their implicit hypothesis was that any potential trade gain is due partially to the lifting of barriers at the EU border. Nahuis (2004) shows that for CEECs the highest border effects at entry to the EU occur in the agricultural and food sector, and he consequently anticipates the highest trade gain for these products. Manchin *et al.* (2003 and 2005) estimate the impact technical barriers have on border effects between the EU and CEECs. More precisely, following Brenton *et al*. (2001), they look at how the different modalities adopted by the EU to harmonise regulation within the single market impact on trade with CEECs. They conclude that the less harmonized the standards are, the higher the border effect they have.

The goal of this paper is to reveal the role of both tariffs and non tariff barriers (NTBs) in the NMS agri-food exports to the EU market, by quantifying the border effect faced by NMS and assessing to what extent tariffs and NTBs have impeded trade flows in the pre-accession period.

The rest of this section sets out how, from our gravity equation, we propose to catch the overall impediments faced by countries at entry to the EU market (border effect), and to capture in this border effect the role of tariffs and non tariff measures. Finally, the econometric issues are addressed.

1. The theoretical framework.

Gravity models represent one of the most common options for assessing bilateral trade flows, either in the "classical" specification or in their further developments within the new international economics theory[ii]. The model proposed hereafter follows on from new developments in gravity equations made notably by Anderson and van Wincoop (2003). The main hypotheses for the model used are set out

below, while the technical details on the derivation of the model can be found in Appendix 1.

Following Anderson and van Wincoop (2003), it is assumed that all goods are differentiated by origin, consumer demand (in the importing country) being defined by a CES utility function. This specification allows both components of total demand - imports and domestic production – to be taken into account. At the disaggregated level of this current study (i.e. at product level)[iii], the empirical estimation faces a serious data constraint: production data are not available for all products and all countries. To get around this difficulty, our proposal is to focus exclusively on the EU's import flows, by modelling not the total demand, but the *import demand* for individual agri-food products (without looking at the domestic supply**)**. In other words, intra-national flows are excluded from our analysis. This implies adding a major supplementary hypothesis to Anderson's model, i.e. that the consumer follows a two-step budgetary procedure. In the first step, the importing country's consumers define the import demand, choosing between domestic and imported products in order to satisfy the total demand. In the second step, the import demand is differentiated by country of origin. Thus, only this second step of the budgetary procedure is examined, under the assumption that the first one has already been carried out, and thus the total import demand already defined.

The model is synthesised in the following equation:

$$x_{ijk} = \frac{x_{ik} m_{jk}}{Y_{wk}} \left(\frac{P_{ijk} / P_{jk}}{\Psi_{ik}} \right)^{1-\sigma} \qquad (1)$$

where x_{ijk} is the nominal value of exports from *i* to *j* for product *k*

m_{jk} is the total expenditure of j for the imported product k (the total imports of *j*)

x_{ik} is the total exports of *i* for product *k*

Y_{wk} is the total world trade in product k (sum of total imports for product k for all countries j)

P_{ijk} is the delivered price of product *k* from country i, paid by consumer in *j*

P_{jk} is the CES index import price of product k in country *j*

thus P_{ijk} / P_{jk} is the price competitiveness of *i* on market *j*.

And Ψ_{ik} is a CES index of price competitiveness of *i* on the world market (see equation 9 Appendix 1).

The delivered price P_{ijk} differs from the exporter's supply price P_{ik}, because of trade costs between *i* and *j*. These trade costs are broadly defined to include all costs incurred in getting a good to the final user, excluding the production cost of the good itself (Anderson and van Wincoop, 2004). It is also called the 'bilateral trade resistance' and encompasses mainly tariffs, transport costs, and non-tariff barriers. Taking into account the trade costs (Tijk), the relation between the two prices becomes: $P_{ijk} = P_{ik} T_{ijk}$. Thus (1) may be rewritten as follows:

$$x_{ijk} = \frac{x_{ik} m_{jk}}{Y_{wk}} \left(\frac{T_{ijk}(P_{ik}/P_{jk})}{\Psi_{ik}} \right)^{1-\sigma} \qquad (2)$$

where $\frac{P_{ik}}{P_{jk}}$ may be defined as the cost competitiveness of i in comparison to that of j (without any trade barrier).

Following Péridy (2005), it is assumed that T_{ijk} - in addition to policy-related barriers (e.g. tariffs and NTBs) and transport costs (proxied by distance) - also reflects other border variables (B_{ijk}) stimulating bilateral trade (a common border, a common language, etc.), and the remaining trade resistance effect (O_{ijk}) inhibiting trade (cultural differences, home bias, etc.). Among these other factors, Chen (2004) or Disdier *et al* (2006) investigate informal trade barriers, such as product-specific information costs, and their role in explaining the trade reduction effect. T_{ijk} therefore becomes:

$$T_{ijk} = d_{ij}^{\rho} t_{ijk}^{\theta} NTB_{ijk}^{\lambda} B_{ij}^{\varsigma} O_{ijk}^{\nu} \qquad (3)$$

where $\rho < 0$, (the higher the transport costs, the lower the bilateral trade) and $\theta < 0$ (the higher the tariffs, the lower the exports). The sign of λ is not defined (see OECD, 2002; Beghin and Bureau, 2001). It depends on the nature of the regulation. Some regulations may act as transaction costs and

reduce trade. For others, the regulation may in a first instance act as a barrier when products do not meet standards, but once standards are met they may facilitate trade. ζ is expected to be positive (countries are supposed to exchange more when they share a common border, a common language or a common historical link). $\nu < 0$: the higher the unobserved trade resistance, the lower the exports.

While checking for possible endogeneity of total exports (Xik), total imports (Mjk) and world demand (Ywk), these three variables have been moved to the left side of the equation[iv]. This solution constrains the coefficient of total exports, total imports and world demand to be equal to 1. In this way it is not the value of the bilateral flow which is regressed but the coefficient of relative bilateral trade intensity (RI_{ijk}) (Freudenberg *et al*., 1998).

$$RI_{ijk} = \frac{x_{ijk} / m_{jk}}{x_{ik} / Y_{wk}} \qquad (4)$$

This index compares the proportion of imports of good k from i in the total imports of j, to the market share of the exporter i in the international market. An index equal to 1 means that the flow of good k between j and i is determined only by the size of the partners. A coefficient other than 1 means that trade is determined by other factors than country size: if it is greater than one, it denotes privileged trade links between i and j for good k, whereas an index less than one refers to trade resistance between the two countries which could be explained by the low competitiveness of j, but also by trade costs.

2. A step by step empirical assessment of trade resistance: the role of tariffs and NTBs in the border effect.

Since most impediments to trade are difficult to measure (notably what we have called "other trade resistances") it is first necessary to establish a global measure of trade resistances faced by CEECs at entry to the EU market. This global image is the border effect defined by Mayer and Zignago (2005). To catch this effect and then investigate the role of tariffs and non tariff measures, it is necessary to proceed in several steps.

The *first step* is to measure the overall border effect faced by third countries at entry to the EU. We therefore regress model [1] directly derived from eq [2] of the theoretical part. In this way, it

is possible to measure the impact of price competitiveness, transport costs and cultural proximity (border contiguity and historical links) on bilateral trade between i and j. j is a EU-15 importing country and i an exporting country (European or not)

$$\ln(RI_{ijk}) = \alpha_0 \ln\frac{P_{ik}}{P_{jk}} + \alpha_1 \ln\psi_{ik} + \alpha_2 \ln d_{ij} + \alpha_3 B_{ij} + \sum_i \alpha_4^i T_i + \sum_k \alpha_5^k K_k + \varepsilon_{ijk} \quad \text{[model 1]}^{v}$$

Recalling eq [2] of the theoretical part, T_{ijk} becomes $(T_{ijk})^{1-\sigma} = d_{ij}^{\alpha_2} B_{ij}^{\alpha_3} T_i^{\alpha_4^i} K_k^{\alpha_5^k}$. Thus, T_i are exporting-country dummies included in order to catch all the other trade impediments than transport costs faced by country i at the entry of the EU market (whatever the EU importing country). While taking into account heterogeneity of countries, to avoid numerous dummies[vi], four country-group dummies have been included, each of them corresponding to the area the exporting country belongs to: NMS (the New member states), AC (Acceding countries i.e Romania and Bulgaria), EU (the 15 EU member states) and ROW (the Rest of the Word)[vii]. The coefficients α_4^i of these dummies are calculated with regard to that of the EU dummy, the EU member states being supposed to face the lowest trade resistance at entry to the market of their EU partners. These coefficients catch the border effect faced by EU trading partners. Dummies K_k capture specific product effects.

This first step, then, allows the following questions to be answered:

i/ what is the magnitude of the border effect faced by trading partners at entry to the SEM?; ii/ what is the situation for NMS and acceding countries?; iii/ has the border effect changed over time?

The *second step* is to analyse the role of tariffs for each group of countries, and the overall impact of NTBs for all exporting countries. Hence the estimated equation becomes [model 2][viii]:

$$\ln(RIi_{ijk}) = \alpha_0 \ln\frac{P_{ik}}{P_{jk}} + \alpha_1 \ln\psi_{ik} + \alpha_2 \ln d_{ij} + \alpha_3 B_{ij} + \sum_i \alpha_4^i T_i + \sum_k \alpha_5^k K_k + \sum_i \alpha_6^i t_{ijk} + \alpha_7 San_k + \alpha_8 Phyto_k + \alpha_9 Qual_k + \varepsilon_{ijk}$$

α_6^i catches the different impact of tariffs (t_{ijk}) for the three groups of countries (NMS, AC and ROW). α_7 , α_8 α_9 capture the overall impact of the different NTBs included in the model (San, Phyto and Qual are dummy variables indicating the presence of a NTB measure: respectively sanitary measures; phytosanitary and quality measures). Finally, the coefficient α_4^j catches the impact of remaining trade

resistance for NMS, AC and the ROW with regard to the EU.

This second step therefore allows the following questions to be answered:

i/ is border effect totally explained by tariffs and NTBs? ;ii/ does the impact of tariffs vary between the three groups of countries?; iii/ what is the overall impact of NTBs?; iv/ have these impacts changed over time?

The aim of *the third step* is to evaluate the role of each NTB for each group of countries. For the sake of simplicity, only the model for sanitary measures [model 3] is presented here,: the other two being derived in the same manner

The estimated equation becomes: [model 3][ix]

$$\ln(RIi_{ijk}) = \alpha_0 \ln\frac{P_{ik}}{P_{jk}} + \alpha_1 \ln\psi_{ik} + \alpha_2 \ln d_{ij} + \alpha_3 B_{ij} + \sum_k \alpha_5^{nk} K_k + \sum_i \alpha_6^i t_{ijk} + \sum_i \alpha_7^{i,0} San_{ik}^0 + \sum_i \alpha_7^{i,1} San_{ik}^1 + \alpha_8 Phyto_k + \alpha_9 Qual_k + \varepsilon$$

San_{ik}^1 is a dummy indicating the presence of a sanitary measure for product k imported from i. Hence, α_7^{i1} measures the border effect for products subject to sanitary measure imported from i.; while α_7^{i0} concerns products not subject to sanitary measures originating from i. The difference between α_7^{i1} and α_7^{i0} therefore evaluates the impact of the sanitary measure on the border effect.

This third step therefore allows the following questions to be answered:

i/ how much do NTBs increase or reduce the border effect for each group of countries?; ii/ have these impacts changed over time?; iii/ may any conclusions be drawn about the role of acquis communautaire for the New Member States?

1. The econometric method.

Insofar as one of our objectives is to assess the impact of different trade barriers and, more precisely, to identify those which prohibit trade, not only actual bilateral trade but also "zero values" i.e. all potential bilateral flows must be taken into account [x]. OLS regressions of the relative intensity index would not take into account the high proportion of zero trade flows, and so would lead to biased estimators. An efficient way to take such a selection bias into account is to use the Heckman procedure (Heckman, 1979; Greene, 1981). This method makes it possible to assess whether selection bias is

present, to identify factors contributing to the selection bias, and to control for this bias in estimating the outcomes of interest. The Heckman method attempts to control for the effect of non-random selection by incorporating both the observed and unobserved factors that affect non-response (Sales *et al*., 2004). Consequently, the effects of the different trade barriers are tested at two stages of the export process: first, the decision of a country to export or not (actually the global decision of a nation's potential exporting firms); second, when export occurs, the effects of trade barriers on the volume of traded products (more precisely the value of the log of the Relative Bilateral Intensity of trade R_{iijk}).

In order to compare the dynamics of the role played by various trade barriers (between 1999 and 2004) a cross-section analysis is used and the data for the two years are pooled. The significance level of the difference between coefficients obtained for the two years is tested through a Wald test[xi]. Moreover, in order to be able to compare coefficients from one model to another and because the coefficients were stable, the different models have been nested by constraining α_1 α_2 α_3 to be equal to those obtained in [model 1]. Finally the residuals of the estimations have been controlled graphically to validate the assumption of their normality.

III. Data and variables

In what follows, the analysis focuses on imports to the EU from all its trading partners (EU and non-EU members). The index of relative bilateral intensity of trade RI_{ijk} has been computed using the COMTRADE database. Data have been aggregated at 4-digit level in the Harmonized System, resulting in about 165 products.

The **bilateral cost-competitiveness** is the ratio between i's export price (P_{ik}) and the j's import for product *k* (P_{jk}). P_{jk} should normally be a CES index of import price. The average import price of *j* has been used as a proxy of this index (*i.e* the unit value of the total imports of *j*). For P_{ik} the FOB unit value of the export of *i* to the market *j* is used. Because of the lack of data about quantities in the COMTRADE database, these unit values have been computed from the COMEXT Database at 4-digit level.

Nonetheless, as the necessary data for calculating the index of global competitiveness (Ψ_{ik}) are not

available, this variable has not been introduced into our estimation. Nevertheless, this omission is not as trivial as it seems. The impact of this effect will be shared among the other variables, notably country dummies Ti (border effect).

For the **transport costs** between two countries, the distance d_{ij} (calculated by the CEPII[xii]) between the capitals of i and j has be taken as a proxy. As far as **the contiguity variable** (Bij) is concerned, a dummy variable has been introduced, equal to 1 if the two trading partners have a common border, otherwise equal to 0. **The common history** has been caught through the dummy variable which is equal to 1 if the exporting country was a colony of its trading partner. As for the **tariffs,** t denotes the tariff applied by the EU country j to its partner i for the product k. This information is available from the *TARIC Database* (DG Taxation) and it is the same for every EU country due to the common commercial policy and is therefore t_{ik} rather than t_{ijk}. Because t_{ik} is considered to be a measure of all the taxes country i has to pay at entry to the EU market, the calculation takes into account preferential agreements where they exist (notably the European agreements in view of the CEECs accession to the SEM) and all the measures applied (i.e not only the ad-valorem part of the tariffs, but also the specific duties). Hence t_{ik} is an *ad-valorem equivalent*[xiii] for tariffs. Finally, in order to avoid eliminating from the estimation products not subject to tariffs ($\ln t_{ik} = \infty$), the variable is transformed in the following way: $\ln t_{ik} = \ln\left(t_{ik} + 1\right)$.

When entering the EU market, each specific product coming from a third country should be submitted to a wide-ranging set of regulations. Different **non-tariff variables** have been built in order to capture the set of border regulations (available on the French customs website (http://www.douane.gouv.fr/). In addition to tariffs, this website provides full information on the commitments that products entering the EU markets should fulfil. There are about 60 such rules applying to agri-food products, classified by the customs office into 15 categories, including sanitary, phytosanitary, commercialisation, public health, protecting wild fauna, and so on.

Starting from this classification, three types of measures are introduced: **1. Sanitary measures; 2. Maximum Residue Level of Pesticides (MRL) and 3. Quality measures.**

In order to meet sanitary requirements veterinary controls imposed inside the EU should be

accompanied by strict border controls. **Sanitary measures therefore** include veterinary measures for animals (breeding and production) designed to protect both animal and public health. They are comprised of different categories: animal health; hygiene of food of animal origin; animal feeds and veterinary pharmaceuticals. The first condition that needs to be met by a third country trying to sell products on the European market is to be on the list of authorized countries[xiv]. This list is defined according to general criteria –the medical state of livestock, the organization of veterinary services, and the medical regulation in force. When crossing the EU border there are three levels of veterinary control: documents are checked, the identity checked and a physical check of the animals is carried out.

The **phytosanitary measure** refers to standards for **the maximum residue level of pesticides** (MRL). In order to protect animal and human health, foodstuffs intended for human or animal consumption in the European Union (EU) are now subject to a MRL of pesticides in their composition. Up until 2005, different directives[xv] were applied to different sectors (fruit & vegetables, cereals, foodstuffs of animal origin - meat & some dairy products - and products of vegetable origin). The objective was to ensure that pesticide residues in foodstuffs do not constitute an unacceptable risk for consumer and animal health.

Quality measures cover the set of standards relating to product quality control, other than sanitary and phytosanitary requirements, for instance commercial characteristics such as freshness, calibration, and conditioning. The products must be accompanied by a quality control certificate. All information must appear on the label, especially for products such as meat, eggs, fresh fruit and vegetables, prepared vegetables, etc.

These three categories of regulation have been introduced into the model as dummy variables. They have a value of 1 if the product is subjected to regulation, and 0 otherwise. Vancauteren and Henri de Frahan (2006) or Haveman and Thursby (2000) did not use a dummy variable, but a "trade weighted coverage ratio" for each category of standards. Working at our detailed level, choosing the alternative measure would make little difference, because for the majority of products at 4-digit level all the goods within a category are subject to the same standards. The product dummy is defined at the 2 digit level of the nomenclature and thus captures the specificity of the groups of products

IV. Results and discussion

From an econometric point of view, the two modelling steps (selection and regression of Bilateral relative intensity) are not independent (value of rho and of Chi2). The results of the Heckman procedure are shown in Table ~~2~~ 4 which presents separately each stage of the export process: i) the decision to export to the European market (Probit estimations) and ii) the regression (volume equation). Results of the volume equation are discussed below. Differences between the results of the selection and the regression part will be presented in the text when necessary (notably when discussing the role of NTBs as trade barriers).

Results obtained in [model 1] for "classical" variables are in line with expectations for a gravity model. Distance restricts trade between two countries. Conversely, having a common border and a common history (colony) stimulates trade between partners. Moreover, the bilateral price competitiveness has a significant impact on trade: the higher the export price of the exporting country compared to the importing price, the lower the volume of exports (Table 2b).

Beside these classical variables, the border effect at entry to the EU market is captured separately for the three geographical zones. For the three groups, the coefficient is significantly negative showing that third countries exchange less with EU countries than EU members among themselves. This effect was greater in 2004 than in 1999. Contrary to what might be expected, the border effect is highest for NMS (-1.42), while it is much lower for Romania and Bulgaria (-0.66). In other words, despite the accession process, trade resistance was still high for NMS on the eve of their integrating the EU. However, this border effect remained stable for NMS over the period while it increased for all other third countries. Does this result reveal a trade diversion effect due to the enlargement process? In fact, the increase of CEEC-10 exports towards the EU has led simultaneously to a decrease in the ROW's share in total EU agro-food imports.

Results from [model 2], when tariffs and NTBs have been taken into account, show a reduced but still significant border effect (Table 2). In other words, determinants other than tariffs and NTBs explain trade resistance at entry to the EU market. This is once again particularly true for NMS for which the border effect remains high (1.05 in 2004).

How can this remaining high level of trade resistance for the CEECs be explained? Among transition-related factors that impede trade and are difficult to measure, Bussière, Firdmuc and Schnatz (2005) mention the low quality of transport infrastructures, the lack of expertise of foreign firms in doing business with these countries, as well as institutional uncertainties surrounding the transition process. It is further stated that over the last decade it has taken time for businesses in CEECs, to make new contacts, to acquire new marketing skills, and to convince the EU and other clients abroad to place trust in them and perceive them as reliable partners. For instance, Rauch (1999) shows that it is more costly to obtain information about the quality or even existence of a foreign product in comparison to a domestic one, and it is likely that these higher costs will reduce the quantity of foreign goods purchased. The role of history also offers some explanation for the geographical orientation of CEECs traders away from the EU (an aspect of global competitiveness or multilateral trade resistance we were not able to measure directly). Despite the disintegration of Eastern Europe – the break-up of the former Soviet Union, Czechoslovakia and Yugoslavia - trade flows between the Czech and Slovak Republics, between the Baltic states, and between Slovenia and former Yugoslavia still remain quite strong, exceeding (according to Fidrmuc and Fidrmuc (2000) normal levels. All newly independent countries in Eastern Europe trade much more intensively with their previous counterparts than with other countries, despite greater open and hidden trade barriers between the successor countries (transaction costs, exchange rate uncertainty and political instability). These results for the former federations in Eastern Europe thus indicate a very strong bias, explaining the trade resistance towards the EU. Hence, as shown in Chart 1, only 29% of Slovene exports are sold to the EU (27% for the Slovak Republic).

Concerning the impact of tariffs, the results of [model 2] in Table 2b highlight the reduction in tariff elasticity for NMS, whilst this coefficient remains stable for the ROW. It is noteworthy that in the probit estimation tariffs no longer act as a trade barrier anymore in 2004 (Table 2b). This is an expected result, since tariffs for NMS were abolished in May 2004, the date of the EU enlargement. However, in 1999 the impact of tariffs was still high because the liberalisation process was far from complete. For Acceding Countries, the effect of association trade agreements is also reflected in the

Probit estimation. But in the regression part, tariff elasticity is positive for these two countries: the higher the tariff, the higher the export volume. What are the reasons behind this very puzzling result? On the one hand, it could be explained by their supply structure. Restructuring the sector in response to the European framework for less protected products would require time and financial assets. For Romania, for instance, agro-food exports account for a very small proportion of the national product (around 5% in 2004) and are mainly oriented towards the EU market. On the other hand, the labour force in these countries is cheap leading to cheap products. Hence, despite tariff duties, products originating from Romania and Bulgaria are competitive on the European market due to their lower prices.

What is the impact of non-tariff measures on the border effect?

Overall impact of NTBs

The three introduced measures – sanitary, phytosanitary and quality standards - have significant negative coefficients in the probit selection part equation (Table 2a, [model 2]). These coefficients catch the impact of sanitary measures on the decision to export towards the EU. Their significant negative sign means that the measures act as a very significant trade barrier for the products concerned. Nevertheless, the impact of sanitary measures in the regression (volume equation) is significantly positive (table 2b, [model2]). Hence once the barrier has been overcome, sanitary measures enhance trade. Conversely phytosanitary and quality measures seem to reduce trade for the products concerned.

The explanation of this contradictory result (between sanitary and phytosnanitary measures) lies more in the ways standards are harmonised across the EU than in the actual content of the measures themselves. In fact, sanitary measures have been regarded as very important by the European authorities whose aim is to guarantee European consumers a uniform and acceptable level of food safety throughout Europe. Hence, since the BSE crisis the European authorities have harmonised their sanitary measures to a very high degree (Ugland and Veggeland, 2006). This wave of harmonisation, which is more complete in the sanitary field than in the other, has even led to a higher degree of market integration through the use of regulation. This tool implies that all member states are obliged to

apply the regulation text strictly - without any national adaptation.

Conversely, regarding residue level of pesticides (phytosanitary measures), pan-EU harmonisation was, up until to 2005,carried out made through EU directives allowing member states a certain latitude to transpose this text in their law. The fact that these directives were transposed differently from one EU member to another means that some technical barriers remain inside the SEM despite the principle of Mutual Recognition and leads to a fragmented market, for the products concerned. The situation is similar for quality measures which encompass commercialisation and labelling considerations.

To sum up, the results obtained suggest that sanitary measures act as trade barriers at entry to the EU market, but once standards are met by exporters they facilitate trade. This result is in line with the assumption made by the OECD (2002), as well as by Barret and Young (2001), who argue that internationally accepted product standards can facilitate international trade by reducing search and adjustment costs. On the contrary, as far as phytosanitary and quality measures are concerned, national differences in the transposition of regulations increase transaction costs for exporters and in this way increase trade barriers. The rest of this section presents more detailed results about the impact of NTBs according to the products' provenance. Due to space constraints and to increase lisibility only results of the value of NTB coefficients are presented. The rest of the variables took expected signs and the majority of them were statistically significant (detailed results available upon request).

Role of NTBs according to the origin of the product

- The impact of sanitary measures.

Table 3 gives the impact of sanitary measures on the EU border effect faced by non-EU countries. This border effect is split according to the presence or absence of sanitary measures for the three groups of countries. Coefficients are estimated with regard to intra-EU trade – for which sanitary measures do not act as a trade barrier. It is noteworthy that according to our estimations, sanitary measures have no impact on intra-EU trade whereas phytosanitary and quality measures hinder intra-EU trade. These results confirm those obtained by Henry de Frahan and Vancauteren (2006) who show that EU harmonisation of food regulation has a major positive effect on intra-EU trade.

INSERT Table 3

For NMS countries, conversely to other third countries, sanitary measures do not increase the barriers faced at entry to the EU market (the coefficients of the probit results are not significantly different for products with and without sanitary measures, Table 3). This result means that, in the decision for NMS to export towards the EU, the border effect is not attributable to the presence of sanitary measures. Moreover, for products submitted to these measures, the volume of trade seems to be higher than for other products. This impact was reinforced between 1999 and 2004. Hence, standards seem to be met and consequently to stimulate trade. There are two possible explanations for this. First, as explained above, a uniform standard across the SEM reduces transaction costs; and second, EU importers place increasing trust in NMS products guaranteed by a standard.

Analysing estimations[xvi] of the sanitary impact for individual country shows that this is particularly true for Hungary, whose products with sanitary measures no longer face trade resistance at entry to EU markets. Given that Hungarian public policy imposes EU regulation as a guideline for its own regulation (Fehèr, 2002), this result is not surprising. Results for Poland, Latvia, Estonia and Lithuania show that the border effect has significantly reduced for products covered by sanitary measures.

For acceding countries, these measures still act as important barriers at entry to the EU market (probit regression) while, in the volume equation, the difference between the two coefficients, for 1999 and 2004, is not significant; meaning that these standards have no (or little) impact on the volume of trade. These results are confirmed by the conclusions of the Standing Committee on the Food Chain and Animal Health (European Commission, 2006), which underline the low level of compliance with EU standards in Bulgarian and Romanian meat and milk establishments (a considerable proportion of raw milk is currently not in compliance with EU requirements). Therefore, from 1 January 2007, these two countries will be accorded a transitional period to upgrade their production processes. During this period, the produce from non-compliant firms will carry a special identification mark and will be sold only on the domestic market. A more important border effect would therefore be expected for these AC products, but taking into account the very low proportion of produce exported, we may assume that Romanian and Bulgarian firms exporting to the EU are compliant with EU standards.

- The impact of phytosanitary measures.

Phytosanitary measures act as a trade barrier at entry to the markets (probit results, table 4). Nonetheless, this result is confirmed only for intra-EU trade and imports from the Rest of the World. For NMS and acceding countries, however, these phytosanitary measures have no impact on the decision to export to the EU market; and results in the probit estimations are not significantly different for the two years. That means that phytosanitary standards would not be a constraint at entry to the EU market for both NMS and Acceding countries. These results are consistent with the fact that these countries are small consumers of pesticides[xvii]. According to the European Environment Agency (2004), the mean consumption of pesticides (insecticides, herbicides, fungicides and others) in 1997 was less than 0.75 kg/ha of UAAL for CEECs as well as for AC, while for the EU15 it was more than 2.25 kg/ha. This situation, due mainly to economic necessity rather than environmental awareness, gives these countries an undeniable comparative advantage regarding the pesticide standards. Hence, CEECs meet the European standards; but as these standards are not uniform across the Single European Market, these measures increase trade costs and reduce the volume of trade; but this impact is much lower both for NMS and Acceding countries than for the EU-15.

- The impact of quality measures.

For quality measures unification is far from complete. Hence, our reference point is intra-European trade of products without quality measures. The results show that, for intra-European trade, quality measures have a negative impact mostly on the selection equation, but this impact tends to disappear in the volume equation. Nevertheless, such measures have less impact on intra-EU trade than on other exporters. This result was expected since intra-EU exporters are supposed to have best access to the single market.

For third countries as well as NMS countries, applying the quality measures reduces both the decision to export and the volume traded. The same conclusion can be drawn in the case of Romania and Bulgaria. The lack of unification of quality measures thus inhibits the volume of internationally traded products in the SEM, whatever the country of provenance. This impact is widely recognised - e.g. food labelling, as a part of quality measures is denoted by OECD (2003) as a “contentious issue concerning agro-food products, for which particular attention is needed in order to minimise the risk of disruptions

of international trade".

.

V. Conclusion

A specific feature of this study is to identify the hindrances to European market access for agricultural and food products according to the origin of products, notably from Central and Eastern European countries. The first result of the paper is that the border effect remains greater for NMS and AC than for countries of the rest of the world, even at the end of the pre-accession period for NMS. The aim therefore is to find explanations of border effects faced by CEECs and to explore whether European Enlargement's event may influence their magnitude.

Concerning the impact of tariffs, the results highlight the reduction in tariff elasticity for NMSs, whilst this coefficient remains stable for the rest of the world. It is noteworthy that tariffs no longer act as a trade barrier anymore in 2004 for NMS. This is an expected result, since tariffs for NMS were abolished in May 2004, the date of the EU enlargement. However, in 1999 the impact of tariffs is still high because the liberalisation process is far from complete.

Concerning non tariff measures, obtained results show that for NMS, sanitary measures do not act as a barrier to trade at entry to the EU market and even significantly stimulate traded volume for NMS firms fulfilling sanitary requirements. For AC these measures still act as barrier to trade, and once the barrier has been overcome, traded volume is slightly increasing. Phytosanitary measures do not act as barrier to trade at entry to the EU market for CEECs' products (both from NMS and ACs) but still limit traded volume. For third countries as well as NMS and AC, applying the quality measures reduces both the decision to export and the volume traded. The lack of unification of quality measures thus inhibits the volume of internationally traded products in the SEM, whatever the country of provenance. The impact of NTBs on the degree of European market access is less a matter of the specific nature of the NTB than of the degree of SEM harmonization among countries of the SEM

These results call for two comments. The first comment deals with the CEECs fulfilments of the EU requirement (in other word, the *acquis communautaire* process efficiency). Sanitary measures have been fulfilled in NMSs leading to a non significant impact of such measures on decision to trade, whereas for ACs it was not the case, justifying therefore the transition period imposed by European authorities. Concerning phytosanitary measures, they do not act as trade barriers for CEECs product rather because the use level of pesticide is structurally low in those countries than because of the implementation of the *acquis communautaire*.
The second comment deals with the opposite impacts of sanitary and phytosanitary measures on traded volume. Results concerning sanitary measures is easily explained because the high degree of food

safety policies' integration in the EU. Phytosanitary and quality measures, far from integration on the SEM, still limit traded volume. Even the intra EU-15 trade is concerned by the negative role of those measures both on the decision to trade and on the traded volume.

Results also show border effect is not totally explained by tariffs and non tariff measures, remaining trade resistances are still significant. In other words, determinants other than tariffs and non tariff measures explain trade resistance at entry to the EU market. This is particularly true for NMSs for which the border effect remains high. This fact calls for further investigation of several issues such as i) specific assets of these countries (as low transport infrastructure for instance), ii) still existing role of history in the geographical orientation of CEECs trade away from the EU, iii) the opinion of European importers and consumers about the products originating from CEE .

The impact of enlargement should expectedly reduce this remaining resistance. First structural development programmes launched by the EU on the eve of accession and still in progress should improve specific assets. Secondly, the adoption of European standards CEEC firms should be less competitive than before on their previous partner market, since higher standards imply higher prices . This fact will clearly lead to a new orientation of CEECs trade toward the SEM.

References

Anderson, J. E. and van Wincoop, E. (2003). Gravity with gravitas: A solution to the border puzzle, *American Economic Review*, 93(1): 170-92.

Anderson, J.E., and van Wincoop, E., 2004. Trade costs. National Bureau of Economic Research Working Paper # 10480.

Barret, C., and Yang Y., 2001. Rational incompatibility with international product standard. *Journal of International Economics* 54(2001): 171-191.

Brenton, P., Sheehy, J. and Vancauteren, M., 2001. Technical barriers to trade in the European Union: Importance for accession countries. Journal of Common Market Studies 39, 265-284.

Bureau, J.-C. and Beghin, J. C., 2001. Quantitative policy analysis of sanitary, phytosanitary and technical barriers to trade. *Economie Internationale*, 107-130.

Bussiere, M., Fidrmuc, J., Schnatz, B., 2005. Trade integration of Central and Eastern European countries. Lessons from a gravity model. European Central Bank. Working Paper Series, No. 545. 39 pp.

Chen, N., 2004. Intra-national versus international trade in the European Union: Why do national borders matter? *Journal of International Economics* 63, 93-118.

Disdier, A., and Mayer, T., 2006. Je t'aime, moi non plus: Bilateral opinions and international trade. CEPII Working Paper No 2006-01. 34 pp.

European Commission, 2006. IP 06/1641. More veterinary and food safety decisions for after Enlargement agreed. Available at:
http://europa.eu/rapid/pressReleasesAction.do?reference=
IP/06/1641&format=HTML&aged=0&language=EN&guiLanguage=fr

European Environment Agenc, 2004. Agriculture and the Environment in the EU accession countries. Environmental Issue Report No. 37. 55 pp.

Eurostat (2006). Europe in figures. Eurostat Yearbook 2005 online. http://epp.eurostat.ec.europa.eu/portal/page?_pageid=1334,49092079,1334_49092794&_dad=portal&

_schema=PORTAL
Evenett, S.-J. and W. Keller., 2002. On theories explaining the success of the gravity equation, *Journal of Political Economy*. April, 110(2), 281-316.
Fehér I., 2002. Meeting EU standards in Eastern Europe: the case of the Hungarian agri-food sector, *Food control*, 13: 93-96
Fidrmuc, J., and Fidrmuc J., (2000). Integration, disintegration and trade in Europe: Evolution of trade relations during the 1990s. Centre for Economic Research Working Paper 2000-12. 27 pp.
Freudenberg, M., Gaulier G., and Ûnal-Kensenci, D., (1998), 'La régionalisation du commerce international: Une évaluation par les intensités relatives bilatérales', document de travail 1998-05, Paris: CEPII, 101 p.
Gallezot J, and Harel M, DB TaR, Software of analysis of the agricultural and agri-food tariffs for the European Union, available at INRA, UMR Publics economics Paris and LERECO Nantes
Haveman, J. and Thursby, J.G., 2000. "The impact of tariff and non-tariff barriers to trade in agricultural commodities : A disaggregated approach.," Purdue University, 21 p.
Head, K. and Mayer, T., 2000. Non-Europe: The Magnitude and Causes of Market Fragmentation in the EU.
Head, K. and Mayer, T., 2002. Effet frontière, intégration économique et "forteresse europe". *Economie et Prévision*, 71-92.
Heckman, J.-J., 1979. Sample selection bias as a specification error. *Econometrica* 47, 153-61.
Manchin, M. and Pinna, A. M., 2003. Border effects in the enlarged EU area. Evidence from imports to applicant countries. Center for European policy Studies.
Mayer, T. and Zignago, S., 2005. Market Access in Global and Regional Trade. CEPII Working Paper No 2005-02, January.
McCallum, J., 1995. National Borders Matter: Canada-U.S. Regional Trade Patterns. The American Economic Review 85(3):615-623.
Nahuis, R., 2004. One size fits all? Accession to the internal market; an industry-level assessment of eu enlargement. *Journal of Policy Modelling* 26, 571-586.
OECD, 2002. Vue d'ensemble des obstacles non tarifaires : Résultats des enquêtes auprès des entreprises. OECD, Paris.
OECD (2003). Agro-food products and technical barriers to trade: A survey of issues and concerns raised in the WTO's TBT Committee.
Papazoglou, C., Pentecost, E.J., Marques, H., 2006. A Gravity Model Forecast of the Potential Trade Effects of EU Enlargement: Lessons from 2004 and Path-dependency in Integration. The *World Economy* 29(8): 1077-1089.
Peridy, N., 2005. Towards a new trade policy between the USA and middle-east countries: Estimating trade resistance and export potential, *World Economy* 28(4): 491-518.
Rauch, J.E., 1999. Networks versus Markets in International Trade. Journal of International Economics, 48: 7-35.
Sales, A.E., Plomondon M.E., Magid, D.J., Spertus, J.A., Rumsfeld, J.S., 2004. Assessing response bias from missing quality of life data: The Heckman Method. Health Quality Life Outcomes 2:49. Published online 2004 September 16.
Ugland T., Veggeland F., 2006. Experiments in Food Safety Policy Integration in the European Union, Journal of Common Market Studies, 44 (3), pp 607-624.
Vancauteren, M. and Henry de Frahan, 2006. Harmonization of food regulation and trade in the single market: Evidence from dissagregated data, European review of Agricultural Economics, 33 (3), pp 337-360.

Table 1: Tariffs applied by the European Union. Arithmetic average for agricultural and food products

	1999	2004
Czech Repubic	14.91	5.49
Estonia	15.81	5.16
Hungary	15.05	4.93
Lithuania	16.13	5.14
Latvia	16.15	5.36
Poland	13.98	5.83
Slovenia	16.36	5.95
Slovakia	14.93	5.42
Bulgaria	14.62	5.5
Romania	14.58	8.22
MFN rate	18.1	16.3

Source: own computations based on TARIC database

Table 2: Impact of tariffs and NTBs on the EU Border Effect **:**

Table 2a Results of the probit model

Probit	model 1 :		model 2 :	
	1999	2004	1999	2004
Imports	0.07 (0.001)	0.06 (0.001)		
Exports	0.24 (0.001)	0.24 (0.001)		
Distance	-0.57 (0.003)	-0.53 (0.003)		
Contiguity	0.28 (0.01)	0.25 (0.01)		
Colony	0.68 (0.01)	0.80 (0.01)		
Border effect (reference to EU)				
ROW	-0.23 (0.009)	-0.29 (0.008)	-0.17 (0.008)	-0.18 (0.007)
NMS	-1.10 (0.01)	-0.98 (0.01)	-0.92 (0.02)	-0.92 (0.02)
AC	-0.77 (0.03)	-0.69 (0.02)	-0.63 (0.04)	-0.57 (0.03)
Tariffs				
Tariffs ROW			-0.03 (0.003)	-0.04 (0.003)
Tariffs NMS			-0.08 (0.009)	-0.004* (0.01)
Tariffs AC			-0.04 (0.02)	-0.02* (0.02)
NTBs				
Sanitary measures			-0.21 (0.008)	-0.29 (0.008)
Max level of Residues			-0.26 (0.01)	-0.12 (0.01)
Quality			-0.08 (0.009)	-0.18 (0.009)

Table 2b Results of the regression equation of the Relative Bilateral Index

ln(RIijk) Relative Bilateral Index	model 1 :		model 2 :	
	1999	2004	1999	2004
Competitiveness	-0.17 (0.009)'	-0.15 (0.01)		
Distance	-0.27(0.005)	-0.27 (.005)		
Contiguity	1.80 (0.03)	1.77 (0.03)		
Colony	1.32 (0.03)	1.44 (.03)		
Border effect (reference to EU-15)				
ROW	-1.04 (0.02)	-1.25 (0.02)	-0.47 (0.02)	-0.54 (0.02)
NMS	-1.42 (0.04)	-1.40 (0.03)	-0.92 (0.06)	-1.05 (0.06)
AC	-0.55 (0.09)	-0.66 (0.08)	-0.45 (0.13)	-0.51 (0.10)
Tariffs				
TariffsROW			-0.39 (0.009)	-0.44 (0.01)
Tariffs NMS			-0.30 (0.03)	-0.19 (0.03)
Tariffs AC			0.36 (0.07)	0.37 (0.06)
NTBs				
Sanitary measures			0.26 (0.02)	0.16 (0.02)
Max level of Residues			-0.19 (0.03)	-0.09 (0.03)
Quality			-0.10 (0.02)	-0.19 (0.02)
Nb of observations : 586 568 ; censored obersvations : 473 473				
Validation of selection bias in both models (Rho significantly ≠0)				

Notes: * denotes non-significant coefficients at 15 per cent. All the other coefficients are significant at less than 10 per cent. Standard errors are reported in brackets.

Table 3: The impact of sanitary measures on the EU border effect

Sanitary measures		Regression results on the volume of trade		Probit results on the decision to export	
		1999	2004	1999	2004
Rest of the World	NO	-0.38 (0.03)	-0.57 (0.03)	-0.11 (0.01)	-0.10 (0.009)
	YES	-0.35 (0.03)	-0.65 (0.03)	-0.26 (0.009)	-0.37 (0.009)
New Member States	NO	-0.99 (0.08)	-1.27 (0.07)	-0.92 (0.02)	-0.99 (0.02)
	YES	-0.74 (0.07)	-0.81 (0.07)	-0.94 (0.02)	-0.96 (0.02)
Acceding countries	NO	-0.48 (0.17)	-0.61 (0.12)	-0.56 (0.05)	-0.46 (0.04)
	YES	-0.32 (0.15)	-0.43 (0.12)	-0.72 (0.05)	-0.77 (0.04)

Note: Standard errors are in brackets

Table 4: The impact of phytosanitary measures on the EU border effect

Max level of Residues		Regression results on the volume of trade		Probit results on the decision to export	
		1999	2004	1999	2004
Rest of the World	NO	-0.37 (0.03)	-0.21 (0.009)	-0.22 (0.009)	-0.58 (0.02)
	YES	-0.66 (0.04)	-0.44 (0.01)	-0.33 (0.01)	-0.72 (0.04)
New Member States	NO	-0.91 (0.06)	-0.96 (0.02)	-0.98 (0.02)	-1.11 (0.07)
	YES	-1.08 (0.09)	-1.18 (0.03)	-1.01 (0.03)	-1.04 (0.08)
Acceding countries	NO	-0.46 (0.15)	-0.71 (0.05)	-0.62 (0.04)	-0.62 (0.11)
	YES	-0.57 (0.17)	-0.82 (0.05)	-0.69 (0.05)	-0.45 (0.13)
EU15	YES	-0.19 (0.04)	-0.37 (0.02)	-0.23 (0.02)	-0.10 (0.04)

Notes: standard errors are in brackets. Because phytosanitary measures (Maximum Level of Residue of Pesticides) has an impact on intra-EU trade, the reference here is to intra-EU trade for products without any MLR regulation.

Table 5: The impact of quality measures on the EU border effect

Quality		Regression results on the volume of trade		Probit results on the decision to export	
		1999	2004	1999	2004
Rest Of the World	NO	-0.37 (0.03)	-0.57 (0.02)	-0.18 (0.009)	-0.19 (0.008)
	YES	-0.54 (0.04)	-0.81 (0.03)	-0.26 (0.01)	-0.38 (0.01)
New Member States	NO	-0.88 (0.06)	-1.04 (0.06)	-0.92 (0.02)	-0.93 (0.02)
	YES	-1.01 (0.10)	-1.22 (0.10)	-0.98 (0.02)	-1.04 (0.03)
Acceding countries	NO	-0.42 (0.13)	-0.48 (0.10)	-0.66 (0.04)	-0.59 (0.03)
	YES	-0.36 (0.22)	-0.85 (0.18)	-0.49 (0.07)	-0.66 (0.06)
EU15	YES	-0.01 (0.04)	-0.09* (0.04)	-0.13 (0.02)	-0.21 (0.02)

Notes: Standard errors are in brackets. * denotes non-significance at 5 per cent.

ENDNOTES

[i] This material has been not previously presented.

[ii] Among others, see Anderson and van Wincoop, 2003; Evenett and Keller, 2002; Head and Mayer, 2000; Mayer and Zignago, 2005.

[iii] Usually these models are defined at a very aggregated level, but they have been also employed for studies at industry-level (Head and Mayer (2002), Chen (2004), Nahuis (2004), Manchin *et al*. (2003)) and even at product level (Havenam and Thursby, 2000 or Vancauteren and Henry de Frahan, 2006) for the agricultural sector.

[iv] This approach has been used also by Mayer and Zignago (2005).

[v] In regards with theoretical equations (2) and (3), structural value of several coefficients can be deduced: $\alpha_0=1-\sigma$; $\alpha_1=\sigma-1$;$\alpha_2=\rho(1-\sigma)$; $\alpha_3=\zeta\ (1-\sigma)$.

[vi] The dataset is comprised of 212 exporting countries.

vii To capture the CEECs heterogeneity and check the robustness of results, border effect was separated country by country for NMS and acceding countries. The results did not change significantly and are available upon request.

[viii] In regards with theoretical equations (2) and (3), structural value of several coefficients can be deduced: $\alpha_0=1-\sigma$; $\alpha_1=\sigma-1$;$\alpha_2=\rho(1-\sigma)$; $\alpha_3=\zeta\ (1-\sigma)$; $\alpha_4=\nu\ (1-\sigma)$; $\alpha_6=\theta\ (1-\sigma)$; $\alpha_7=\lambda_1\ (1-\sigma)$, $\alpha_8=\lambda_2\ (1-\sigma)$, $\alpha_9=\lambda_3(1-\sigma)$ with λ_i individual NTB effect

[ix] see precedent note. α_7^{i0} and α_7^{i1} are combinations of previous α_7 and α_4

[x] Zero values found in the trade database correspond in fact either to genuine zero flow, or to a flow below a certain reporting threshold. Such thresholds are very low and therefore assimilated to an absence of trade.

[xi] Results of the tests are available upon request.

[xii] Available on the CEPII website : http://www.cepii.fr/

[xiii] Conversion into ad-valorem equivalents has been done using TARAGRO software (Gallezot and Harel, 2004).

[xiv] In the pre-accession period all CEECs10 were on this list, and were therefore able to export to any European country.

xv Directive 76/895/EEC; fruit and vegetables (Directive 76/895/EEC), cereals (Directive 86/362/EEC), foodstuffs of animal origin (Directive 86/363/EEC) and plant products (Directive 90/642/EEC). In order to harmonize them, these directives have been replaced by a unique regulation in 2005: Regulation (EC) No 396/2005 of the European Parliament and of the Council of 23 February 2005 on maximum residue levels of pesticides in products of plant and animal origin

[xvi] Available upon request

[xvii] As recently published by Eurostat (2006), the quantity of commercial fertilisers in 2001 was highest in France, followed by Germany, Spain, UK, Italy, Poland, Ireland, Greece, Netherlands, Czech Republic, Romania, Hungary, Denmark, Finland, Sweden, Portugal, Austria, Lithuania,

Bulgaria, Slovakia, Slovenia, Latvia, Estonia, Cyprus with Malta the lowest.