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TRADE FLOWS BETWEEN THE CORE AND THE NEW PERIPHERAL EUROPEAN UNION' AREAS

Abstract. *After the last enlargement towards East, the European Union (EU) established a new peripheral area. In these conditions we propose to identify the degree of divergence of industrial structure between the new peripheral area and the core of the EU (EU-15), by characterizing their trade relations. The question that arises is to find the most appropriate methods to explain much more the trade between the two areas. The aim of this paper is to analyze the trade flows between this two area's countries using some different panel data estimation methods like as Fixed Effect Model (FEM), Random Effect Model (REM), Hausman -Taylor (HT) and Feasible Generalized Least Squares (FGLS). Using HT method to estimate our gravity model, we get unbiased and efficient parameters estimation, even when a correlation exists between the explanatory variables and the specific unobservable characteristics of each individual. Our findings generally support the literature which suggests that country size, difference between Gross Domestic Product per capita, association agreement, political stability, reform progress, landlocked, geographical distance, and real exchange rate may be important drivers that can affect the international trade flows patterns between those two zones.*

Key-Words: *Gravity models, Panel Data Models, International trade, Comparative advantage.*

JEL CLASSIFICATION: E61, F13, F15, C25

1 Introduction

According to the Copenhagen European Council (1993), new member countries from Eastern Europe joined the European Union (EU). This enlargement is distinguished by its importance, however, both politically and economically. Indeed, it is for the first time when countries belonging to the former communist block have become members of the single market. The integration of these countries raises one third of the population and the area of EU, while wealth increases only by five percent. In fact, the real convergence is at the centre of all economic issues of EU enlargement towards East. The existence of wealth difference among members leads us to question the economic sustainability of enlargement. This integration represent a challenge for the EU, integrating countries whose per capita income is less than 40% of EU average measured in purchasing power parity.

In this paper, we analyze the effects of EU enlargement towards East and more precisely we are interested to see if the integration will strengthen the trade competitiveness on European markets between new members and EU - 15, or taking into account the different development levels, this enlargement will lead to economic divergence. Indeed, we can imagine different post-accession scenarios, but the answer is not evident. However, it seems possible to get information on the dynamics of pre-accession specialization using an empirical approach concerning the catching up process. Another issue we address in this paper is if the development process follows the economic catch-up mechanisms described by traditional economic theory through neoclassical models and then if the economic and social integration favors the real income. In order to answer to these questions we highlight the integration effects on the specialisation of the economies.

Trade specialization evolves considerably over time, thus bringing about different kinds of economic development across countries. The theoretical explication of the flow trade is based on three theories.

- neo-classical trade theory;
- new trade theory and;
- new geography theory.

Neo-classical trade theory explains patterns of regional specialization on the basis of comparative advantages resulting from differences in productivity (technology) (Ricardo, 1817) or endowments (Heckscher, 1919-Ohlin, 1933) between two countries. The basic characteristics of these models are constant return to scale, perfect competition and homogeneous goods.

The neo-classical theory envisages that, the structure of industrial production will be dispersed geographically, as the factors of production and consumers are scattered across regions. Each region will specialize in the production in which has a comparative advantage. In this way inter – industry specialization is stimulated. Inter-industry trade refers to the simultaneous exchange of goods belonging to different sectors.

During the 1980s, new trade theory models were developed to explain high levels of intra-industry trade and the large proportion of world trade between very similar countries (Amiti, 1998). Intra-industry trade also named “two-way trade” is defined as the simultaneous export and import of products which belong to the same sector. Intra-industry trade is prevalent in regions and industries where increasing return to scale in production, monopolistic competition and product differentiation play an important role. The new trade models postulates that increasing returns to scale and trade costs will induce activities to locate in regions with good market access ("the core") away from remote areas ("the periphery"). This will translate in inter-industry specialization between the core regions. Besides, scale economies will lead to intra-industry trade across companies, which will concentrate in the production of a unique differentiated product. These two driving forces will continue until all increasing-returns activities are concentrated near the core of the market, thereby, showing that intra-industry trade between the core and the periphery vanishes (Brülhart, 1998). In the new trade theory, the geographical advantage plays a role, it is however considered as exogenous, as if it was determined by physical rather than economic characteristics.

The new economic geography models indicate instead, that geographical advantage is endogenous and regional specialization is the result of the spatial pattern of agglomeration of economic activities (Krugman, 1991). Firms locate in an economic centre, which can be considered as it only because other firms locate there. This means that there is a cumulative causation process according to which the access of new firms in a location makes it a more attractive site to additional firms. The cumulative causation process is based on technological externalities (learning by doing and knowledge spillovers) and pecuniary externalities between firms. As long as externalities are localized, also production is geographically concentrated, and the logic of increasing returns to scale implies that once pattern of industrialization has been established, it will persist over time.

The inter-branch specialisation scenario offers the possibility to develop the production and the trade flows based on the differences in factor endowments (Rault & Sova, 2008). These specializations are based on traditional sectors and labour-intensive industries, but can be a trap for the structural transformation and for economic activity diversification. In this case, countries are encouraged to exploit their comparative advantage, and this has as consequence a delay in the technological catching-up process, in the intra-industry development and real convergence.

To achieve our objectives we propose an empirical approach. The advantages and disadvantages of different estimation methods of will be reviewed to find the most appropriate one, which allows to obtain unbiased and efficient estimators.

The remainder of the paper is organized as follows. Section 2 presents an overview of the main features of analyses of the international trade in the gravity model framework. Section 3 reports the panel data estimation methods, empirical investigation as well as the econometric results. Section 4 finally concludes.

2 Problem Formulation

The aim of this paper is to analyze the trade flows between core of the EU and new peripheral area's countries using some different panel data estimation methods. Several studies have assessed the evolution of the trade patterns in the transition economies. The attention was given especially to the so-called accession countries, i.e. transition countries currently seeking EU accession (Aturupane et al. (1997), Fidrmuc et al. (1999), Kaitila (1999), Rault & Sova (2008). The present work aims to extend these studies to the new peripheral EU area's economy. In this paper we try to identify the peculiar characteristics export structure and to show the specialization over time.

The most used model to analyze trade flows is the gravitational. The gravitational model is also used to explication of regionalization and of direct inflows of the investments (Rault & Sova, 2008) and (Ruxanda, 2008). Initially it was inspired by Newton's gravity law. The gravity equation has always been the most empirically successful means of explaining bilateral trade flows, but has met with differing degrees of theoretical respect depending on the extent to which it was seen to have a well-established theoretical foundation.

The first applications including the contributions of Tinbergen (1962) and Pöyhönen (1963) were rather intuitive, without great theoretical claims. However, these studies were criticized for their lack of robust theoretical foundations. The new international trade theory provided theoretical justifications for these models in terms of imperfect competition, increasing returns of scale, and transport costs. Linnemann (1966) proposed a gravity model derived from a Walrasian, general equilibrium model where he explained exports of country ***i*** to country ***j*** in terms of the interaction of three factors: potential supply of exports of country ***i***, potential demand of imports from the country **j** and a factor representing trade barriers. This model shows as:

$$X_{ij} = e^{\alpha_0} Y_i^{\alpha_1} N_i^{\alpha_2} Y_j^{\alpha_3} N_j^{\alpha_4} D_{ij}^{\beta_5} e^{\sum_k \gamma^k P_{kij}} \qquad (1)$$

where:

$\mathbf{Y_i}$, $\mathbf{Y_j}$ represent country's ***i*** and country's ***j*** incomes, $\mathbf{N_i}$ **and** $\mathbf{N_j}$ represent the population country ***i*,j** , $\mathbf{D_{ij}}$ is the geographical distance between country ***i*** and country ***j*** and P_{kij} includes dummy variables. Anderson (1979), Bergstrand (1985), Helpman and Krugman (1985) provided further theoretical justifications for this model. This equation was extended by Bergstrand (1989) by including per capita income, which is an indicator of demand for luxury versus necessity goods. Thus, the gravity model becomes well adapted to the new theory of international trade (the imperfect competition, returns of scale) but also to the traditional theories[1] (the pure and perfect competition). This makes it a solid tool for the evaluation of the effects of other factors on trade, even if it cannot easily be used to discriminate among competing theories of international trade.

3 Problem Solution

3.1 Panel data estimation methods

In the approach to panel data models, we have two alternative different estimation methods to treat individual effects: first called a "random effect method - REM" when it is treated as a random variable and the second called "fixed effects method - FEM" when it is treated as a parameter to be estimated for each cross-section observation (Rault & Sova 2008). When unobserved effects are treated as random variables, the key issue is whether the unobserved effect is correlated or not with the explanatory variables because in case of correlation the empirical results are biased (Wooldridge 2005). Basically, we have two alternative different estimation methods,

[1] Heckscher-Ohlin(H-O) model highlights the importance of the difference in factor endowments

REM which is associated with GLS estimator and the FEM which is related to the "within" estimator.

3.1.1. Within estimator (FEM)

The fixed effect model can be written as:

$$y_{it} = \sum_{k=1}^{K} \beta_k x_{itk} + \alpha_i + u_{it}, \; t = 1, 2, \ldots, T,$$

k=1, 2,,K regressors, i=1, 2,..,N individuals (2)

where α_i denotes individual effects fixed over time and u_{it} is the disturbance terms.
By subtracting from (2) average of this equation over time for each *t*, it obtains

$$y_{it} - \overline{y}_i = \sum_{k=1}^{K} \beta_k (x_{itk} - \overline{x}_{ik}) + (u_{it} - \overline{u}_i) \quad (3)$$

where :

$$\overline{y}_i = T^{-1}\sum_{t=1}^{T} y_{it} \;,\; \overline{x}_i = T^{-1}\sum_{t=1}^{T} x_{it} \text{ and } \overline{u}_i = T^{-1}\sum_{t=1}^{T} u_{it} \;;$$

$y_{it} - \overline{y}_i$, $x_{itk} - \overline{x}_{ik}$ and $u_{it} - \overline{u}_i$ are the time-demeaned data on *y*, x and u. In the fixed effect transformation, it can remark the disappearance of unobserved effect α_i, which yields unbiased and consistent results. This pooled OLS estimator that is based on the time-demeaned variables is called the fixed effects estimator or the *within* estimator.

3.1.2. Random estimator (REM)

The *random* model has the same form as before (2)

$$y_{it} = \beta_0 + \beta_1 x_{it1} + \beta_2 x_{it2} \ldots\ldots\ldots\ldots + \beta_k x_{itk} + \alpha_i + u_{it} \quad (4)$$

where an intercept β_0 is included. Equation (4) can became a random effect model in assumption that the unobserved effect α_i is uncorrelated with each explanatory variable:

$$\mathrm{Cov}(x_{itk}, \alpha_i) = 0,\; t = 1,2,\ldots, T;\; j = 1,2,\ldots, k. \quad (5)$$

In the presence of correlation of the unobserved characteristics with some of the explanatory variables the random effect estimator leads to biased and inconsistent estimates of the parameters[2.] In this case, even if there is correlation between unobserved characteristics and some explanatory variables, the *within* estimator provides unbiased and consistent results. But the *within* estimator has however, two important limits:

[2] Wooldridge (2002)

- it may not estimate the time invariant variables;

- the fixed effect estimator ignores variations across individuals. The individual's specificities can be correlated or not with the explanatory variable. That's why to obtain unbiased results these correlated variables are replaced with instrumental variables uncorrelated to unobservable characteristics.

To choose between FEM and REM we use Hausman test. Hausman test is based on the fact that:

- the random effect estimator is biased if unobservable variables are correlated with the explanatory variables;
- the fixed effect estimator is always unbiased but is less efficient if there is no correlation.

The Hausman (chi^2) test consists in testing the null hypothesis of no correlation between unobserved characteristics and some explanatory variables and allows us to make a choice between random estimator and within estimator.

In the case when some explicative variables are endogenous the instrumental variable method (IVM) allows to identify and to add exogenous variables, which can be used as relevant instruments for these endogenous explanatory variables. But, there is a major difficulty to find external instruments (outside the original specification) uncorrelated with unobservable characteristics. Hausman and Taylor (1981) [3] estimator (hereafter HT) overcomes these problems. Their method allows to estimate the time-invariant variables considering some explanatory variables included in the model as instruments.

3.1.3. The Hausman Taylor method (HT)

In Hausman Taylor method, the explanatory variables are divided into four categories:

1. time varying (X^1_{it}) uncorrelated with individual effects $\alpha_{ij;}$
2. time varying correlated with individual effects α_i,;
3. time-invariant (Z^1_i) uncorrelated with αi;
4. time-invariant (Z^2_i) correlated with α_i.

The considered equation can be writes as follows:

$$Y_{it} = \beta_0 + \beta_1 X^1_{it} + \beta_2 X^2_{it} + Z^1_i \upsilon_1 + Z^2_i \upsilon_2 + \alpha_i + \theta_t + \eta_{it} \quad (6)$$

where:

- β_1, β_2, are vectors of coefficients associated with time-varying and υ_1 , υ_2 are vectors of coefficients associated with time-invariant, uncorrelated (index 1) and correlated (index 2) variables respectively;

- θ_t is the time-specific effects common to all cross section units;

[3] The Hausman – Taylor method relies on an hybrid specification of both the fixed-effect model and the random effect one.

- α_j are individuals effects that account for the effect of all possible time invariant determinants that might be correlated with (X^2_{it}) and/or (Z^2_i) .

- η_{it} is a zero mean idiosyncratic random disturbance uncorrelated within cross-section units and over time periods.

The explanatory variables are not correlated with η_{it}, even if some of them are correlated with α_i. The HT approach consists in using the explanatory variables uncorrelated with α_i as instruments for the correlated explanatory variables.

The (X^2_{it}) regressors are instrumented by the deviation from individual means (as in the Fixed Effect approach) and the (Z^2_i) regressors are instrumented by the individual average of (X^1_{it}) regressors. The (HT) procedure follows 4 steps in the estimation:

(1) *Identification of variables* (X^1_{it}), (Z^1_i) uncorrelated with the unobservable characteristics α_i and (X^2_{it}), (Z^2_i) correlated with the unobservable characteristics α_i.

(2) *Transformation of variables* (X^1_{it}), (X^2_{it}) of the model into deviations from individual means $\Delta(X^1)$, $\Delta(X^2)$ and uncorrelated variables (X^1_{it}) into individual means $\Lambda(X^1)$.

(3) *Selection of instruments* When any variable is of type (Z^2_i), we use deviations from individual means of (X^1_{it}) as instruments, as well as variables (Z^1_i). The HT estimator resulting from this procedure is unbiased, but it is not efficient.

(4) *Improving the efficiency of the estimator* HT suggests applying the instrumental variable method to the transformed model:

$$Y_{it} - (1-\Psi_i)\bar{Y}_i) = [X_{it} - (1-\Psi_i)\bar{X}_i]\beta + \Psi_i Z_i \gamma + \Psi_i \mu_i + [\eta_{it} - (1-\Psi_i)\bar{\eta}_i] \quad (7)$$

where : $\Psi_i = \left(\dfrac{\sigma^2_\eta}{\sigma^2_\eta + T_i \sigma^2_\alpha} \right)^{\frac{1}{2}}$

However the model of Hausman -Taylor suffers at least from three serious imperfections:

a) It is very hard to estimate which explanatory variables are likely to be correlated with the unit effects, because the last are unobserved. Unfortunately, the results depend largely on this decision. The best that is possible is to seek specifications which give results close to those obtained by a fixed effect model (FEM).

b) The non-correlated variables should not be adequate instruments for the correlated variables, which can lead to inefficient estimations.

c) The model of Hausman-Taylor is less effective for the small series.

d) In conclusion, we will not have to wait truly impartial evaluations in the presence of the omitted variables what are correlated with both of the variable dependent and at least of that of the explanatory variables. Procedures as FEM, REM, HT can largely reduce the bias omitted variables.

3.1.4. Feasible Generalized Least Squares (FGLS)

The Pooled Ordinary Least Square (POLS) is a direct extension of OLS to estimate panel data. The generic pooled linear regression model estimable by Ordinary Least Squares (OLS) procedure can be written as :

$$y_{it} = \beta_1 + \sum_{k=2}^{K} \beta_k x_{kit} + \varepsilon_{it} \qquad (8)$$

where i = 1,2,….; N; refers to a cross-sectional unit; t = 1,2,….; T; refers to a time period and k = 1,2,….; K; refers to a specific explanatory variable. Thus, y_{it} and x_{it} refer respectively to dependent and independent variables for unit ***i*** and time ***t***; and ε_{it} is a random error. $ß_1$ and $ß_k$ refer, respectively, to the intercept and the slope parameters. Moreover we can denote the NT × NT variance-covariance matrix of the errors with typical element $E(\varepsilon_{it}\ \varepsilon_{js})$ by Ω.

POLS is often used to estimate the gravity model but does not permit to control for the individual heterogeneity and hence, may yield to biased results due to a correlation between some explanatory variables and some unobservable characteristics.

An alternative method to resolve these issues is generalized least squares (GLS) method. Under certain assumptions, GLS or its operationalized version feasible GLS (FGLS) are more efficient than system POLS. The regression equation for this method may be written in the same form as (8). This equation must be estimated by GLS because this estimation procedure is based on less restrictive assumptions concerning the variance-covariance matrix, Ω, than the classical regression model (Kmenta 1986).

Regarding the problem of estimating parameters ß of the generalized linear regression model, it can write the following expression:

$$ß^* = (x'\Omega^{-1}x)^{-1}\, x'\Omega^{-1}y \qquad (9)$$

This estimation is based on the assumption that the variance-covariance matrix of the errors, Ω, is known. Since in many cases the variance-covariance matrix is unknown, it cannot use GLS. In this case, the use of feasible generalized least squares (FGLS) is preferred. FGLS method uses an estimate of variance-covariance matrix, avoiding the GLS assumption that Ω is known. Consequently, it needs to find a consistent estimate of Ω, say, $\hat{\Omega}$, to substitute $\hat{\Omega}$ for Ω in the formula (9) to get a coefficient estimator β (Kmenta 1986).

Thus we denote the FGLS estimates of β by β^*

This method combines the assumptions concerning serial correlation, contemporaneous correlation and panel heteroskedasticity of errors. The particular characterizations of these assumptions are:

$E(\varepsilon_{it}^2) = \sigma_{it}$ (2.2)

$E(\varepsilon_{it}\varepsilon_{jt}) = \sigma_{ij}$ (2.3)

$\varepsilon_{it} = \rho_i \varepsilon_{it-1} + \nu_{it}$ (2.4)

In this model parameter, ρ_i vary from one cross-section unit to another .

To find consistent estimators of ρ_i and σ^2 (elements of the variance-covariance matrix of the errors) Parks-Kmenta method consists of two sequential FGLS transformations:

a) Elimination of serial correlation of the errors;

b) Elimination of contemporaneous correlation of the errors[4].

This is done by initially estimating equation (1) by OLS. The residuals from this estimation are used to estimate the unit-specific serial correction of the errors, which are then used to transform the model into one with serially independent errors. Then the residuals from this estimation are used to estimate the contemporaneous correlation of the errors. The data is once again transformed to allow for the OLS estimation with now errors. Having obtained consistent estimators of ρi and σ^2, the task of deriving consistent estimators of elements of the Ω has completed. Hence, by substituting $\hat{\Omega}$ for Ω, it can obtain desired estimates of coefficients and of their standard errors (Kmenta 1986, 620).

3.2 Model specification

The gravity equation has been widely used for explaining the bilateral trade flows between countries and for estimating the impact of regional blocks5. Most of these specifications were estimated using cross-section data, which could lead to biased estimates since they do not permit to control individual heterogeneity, which is highly possible in bilateral trade flow data6 . On the other hand, panel data allows the researcher to have greater flexibility in modeling differences in behavior across individuals. A number of different specifications of the equation using panel data have been applied in different contexts in order to try to control individual effects.

Matyas (1997) argues that a correct econometric specification of a gravity equation should control the time, exporter and importer specific effects and hence proposes the following *three-way model*:

$$\ln(Y_{ijt}) = \alpha_0 + \alpha_t + \theta_i + \omega_j + \beta' X_{ijt} + \varepsilon_{ijt} \quad (10)$$

for t =1,..,T; i = 1,..,N and j = 1,.., N, i ≠ j,

where:

$\mathbf{Y}_{ijt}$ are the exports from country i to country j in year t,

[4] The correction for the contemporaneous correlation of the errors automatically corrects for any panel heteroschedasticity.

[5] Frankel (1997), Wei and Frankel (1998) , Bayoumi and Eichengreen (1997), Carrere C(2006)

[6] "Panel data suggest that individuals, firms, states or countries are heterogeneous. Time-series and cross-section studies that do not control this heterogeneity run the risk of obtaining biased results", (see Baltagi, 2001).

$\mathbf{X_{ijt}}$ = [x_{it} x_{jt} …….] is the 1 x k row vector of gravity variables;

$\boldsymbol{\alpha_t}$ is a time-specific effect;

$\boldsymbol{\theta_i}$ is time invariant country-specific effect when the country is an exporter;

$\boldsymbol{\omega_j}$ is a time invariant country-specific effect when the country is an importer;

$\boldsymbol{\varepsilon_{ijt}}$ is the disturbance term which is assumed to follow a normal distribution with a zero mean and a constant variance for all observations and pairwise uncorrelated. In this specification, the time invariant regressors are eliminated even though they are not collinear with the country-specific effects

Egger and Pfaffermayr, (2002) underline that not including the bilateral interaction effect to control heterogeneity may yield to biased estimations and hence propose a similar two-way model (2) but with time-invariant country-pair specific effect, distinct for each direction of trade, when the countries are alternately importer or exporter i.e. $\alpha_{ij} \neq \alpha_{ji}$.

Thus, our econometric model is the following:

$$Log(Y_{ijt}) = a_0 + a_1 log(GDP_{it}) + a_2 log(GDP_{jt}) + +a_3 log(DGDPC_{ijt}) + a_4 log(Dist_{ij}) + a_5 log(Tchr_{ijt}) + +a_6 Acc_{ijt} + a_7 Stp_{ij} + a_8 Sc_{ij+} a_9 Rf_{it} + u_{ij} + \theta_t + \varepsilon_{ijt} \quad (11)$$

where: (i=1,……N; t=1,…..T)

3.3. Data

The estimation period for bilateral trade goes from 1988 to 2006, i.e. 19 years for a sample of 14 countries from EU and 4 CEE countries[7]. Data are organized in panel with two dimensions: countries-pairs, and years. Regarding to the dependent variable, we use logarithm of bilateral trade flux between one country from EU and one from CEE. Data are taken from several well-known international data bases as following:

$\mathbf{Y_{ijt}}$ - bilateral trade flux between countries ***i*** and ***j*** at time t with i ≠ j (source: CHELEM – CEPII);

$\mathbf{a_o}$ - is the intercept;

$\mathbf{GDP_{it}}$, $\mathbf{GDP_{jt}}$ - Gross Domestic Product of country i/j (source : CHELEM- CEPII)

$\mathbf{DGDPC_{ijt}}$ - difference between Gross Domestic Product per capita of country i/j (source: CHELEM- CEPII)

$\mathbf{Tchr_{ijt}}$ - real exchange rate (price competitiveness) (CHELEM, WORLD BANK);

$\mathbf{Acc_{ijt}}$ is a dummy variable that equals 1 if country ***i*** and country ***j*** have signed a regional agreement, and zero otherwise;

$\mathbf{Stp_{ij}}$ - dummy variable equal with 1 if there is a political stability, and zero otherwise (FREEDOM HOUSE);

$\mathbf{Sc_{ij}}$ - dummy variable equal with 1 for not landlocked, and zero otherwise;

$\mathbf{Rf_{it}}$ - index of reforms progress – (BERD)

[7] Austria, Belgium-Luxemburg, Denmark, England, Finland, France, Germany, Greece, Holland , Ireland, Italy, Portugal, Spain, Sweden from EU and Bulgaria, Hungary, Poland and Romania from CEE

$\mathbf{u_{ij}}$ - bilateral specific effect (i = 1,2,…,N, j=1,2,…,M) ;
$\boldsymbol{\theta_t}$ - time specific effect ($t = t_{88,} t_{89} \ldots t_{05}$) for years
1988 → 2005;
$\boldsymbol{\varepsilon_{ijt}}$ - disturbance term, which is assumed to be normally distributed with a zero mean and a constant variance for all observations and to be uncorrelated.

3.4. Empirical results

We apply some panel data estimation methods like as Fixed Effect Model, Random Effect Model, Hausman Taylor and Feasible Generalized Least Square. The results of FEM, REM, HT and FGLS estimations are reported in Table 1 for the whole sample without time effects and in the Table 2 in the presence of time effects (FEM - column 1, REM - column 2, HT - column 3 and FGLS – column 4). We use these panel data techniques to control heterogeneity due to a possible correlation between some explanatory variables and unobserved characteristics in order to avoid getting biased results. (Table 1 and Table 2 of Appendix A)

The coefficients have the expected signs in accordance with the gravity model: a negative impact of geographical distance and of real exchange rate on the trade flows and a positive effect of the variables as the country size, political stability, association agreement, reform progress index and landlocked variables and are statistically significant. In all estimations, we can note that the variable of "difference between GDP per capita - DGDPC" has a positive and significant coefficient, which is in accordance with the Heckscher-Ohlin theory, i.e. the trade between two zones is based on comparative advantage.

The robustness of the estimators allows us to better quantify the impact of the variables on bilateral trade flows. The panel data approach used here permits us to identify country's bilateral specific effects and to isolate them.

A comparison between the estimation leads to the following conclusion:

The calculated Fisher statistics (F = 36.90, Prob > F=0.00) indicate that the introduction of bilateral effects significantly improve the estimated model and hence require the use of an estimation method allowing to consider bilateral specific effects (fixed or random). The introduction of temporal effects is significantly (Table 2). The estimated coefficients of the FEM are different from those obtained with the REM (for instance for GDP, economic distance, or association agreement variables), which can be explained by the existence of a correlation between some explanatory variables and the bilateral specific effect.

Moreover, the calculated statistic of the Hausman test (chi2=260.51, Prob>chi2 = 0.00 in the estimation without fixed effect and chi2=81.17, Prob>chi2 = 0.00 in the estimation with fixed effects) rejects the null assumption of absence of a correlation between the individual effects and some explanatory variables. In this case random estimate is biased and the fixed effects model is preferred. Given the endogeneity of the agreement variable (Acc_{ij}), to take into account possible omitted variables invariant over time, we use the Hausman Taylor method (HT see column (3). Using HT method, we obtain similar coefficients to FEM, we also emphasized the importance of time-invariant variables, and their important impact on trade flows. The presence of time effect not changes the sign of variable, but highlights the signification of some variables as difference in GDP per capita as a proxy for endowment factor and progress of reform. The results obtained with FEM, HT and FGLS are very appropriate.

We consider that the empirical results obtained with HT method (column 3) are more goods than those obtained by using FEM, REM, and FGLS methods.

These results highlight how controlling for unobserved heterogeneity in gravity models can avoid overestimating the effects of variables on the trade volume[8].

4 Conclusions

In this paper we have investigated specialization on the basis of de trade flows between two economies using recent developments of panel data techniques. Indeed, it is now well known that the use of conventional time-series and cross-section methods do not allow to control for unobservable heterogeneity and hence are likely to produce biased results[9]. The particular contribution is that we examine trade specialization of new EU members using panel data techniques to control heterogeneity due to a possible correlation between some explanatory variables and unobserved characteristics in order to avoid getting biased results.

The literature suggests that country size, difference between Gross Domestic Product per capita, association agreement, political stability, reform progress and landlocked variables, geographical distance and of real exchange rate may be important drivers that can affect the international trade flows patterns. Our findings generally support the literature. The empirical results enable us to draw the following conclusions:

From an econometric point of view, the use of the Hausman-Taylor method to estimate the gravity model appears the most convenient for our data sample. More particularly in the presence of correlation between some explanatory variables and the unobserved characteristics (here the unobserved bilateral effect) this method produces consistent parameter estimates contrary to the GLS method. Besides, in contrast to the standard within estimator the Hausman-Taylor method allow to derive parameter estimates for the time invariant variables such as the geographic distance. Our econometric estimations reveal that the country size and the geographical distance variables have significant impact in international trade flows explication and the most important sources of this correlation.

From economic point of view, trade flows between two sets of heterogeneous economies with different levels of economic development are inter-industry. The positive coefficient of the variable, which represents a proxy of comparative advantage, emphasized that economic distance between countries constitutes the specialization determinant of these economics leading to differences in the industrial structure.

[8] See Baier and Bergstrand (2005), Rault and Sova (2007)
[9] Baltagi (2001), Baier and Bergstrand (2005)

In conclusion, there are no statistically significant changes of trade flows, or of the specialization still existing major asymmetries. The result is that the trade flows between new members and the EU is based on the complementarity of comparative advantage. This type of specialization is an increasing factor of economic growth according to economic traditional theory. However, such a specialization scenario does not lead to a fast economic catching up and a real convergence. Thus, CEE countries must take step to move up the value chain. To move up the value chain, via the ladder of dynamic comparative advantage, CEE countries need to produce goods based on higher value added in terms of improved product design and development which, in turn, requires substantial inflows of foreign direct investment.

REFERENCES

[1] **Amiti M. (1998),** ***New Trade Theories and Industrial Location in the EU: A Survey of Evidence,*** Oxford Review of Economic Policy, Vol. 14, No 2.;

[2] **Anderson J. E. (1979),** ***A Theoretical Foundation for the Gravity Equation***, *American Ecomomic Review* 69, p 106 – 116;

[3] **Aturupane C. Djankov S. Hoekman B. (1997),** ***Determinants of Intra-Industry Trade between East and West Europe,*** CEPR Discussion Paper 1721;

[4] **Baier, L.S., Bergstrand, J.H. (2005),** ***Do Free Trade Agreements Actually Increase Members' International Trade?***, *FRB of Atlanta Working Paper* No.3;

[5] **Bayoumi T., Eichengreen B. (1997),** ***Is Regionalism Simply a Diversion? Evidence from the Evolution of the EC and EFTA***, *NBER Working Paper*, 5283;

[6] **Baltagi B.H. (2001),** ***Econometric Analysis of Panel Data***, *John Wiley & Sons Ltd,*New York, 2nd edition;

[7] **Bergstrand J.H. (1985),** ***The Gravity Equation in International Trade: Some Microeconomic Foundations and Empirical Evidence***, *Review of Economics and Statistic*, Vol. 67, pp.474–481;

[8] **Bergstrand, J.H. (1989),** ***The Generalized Gravity Equation, Monopolistic Competition, and Factor Proportions Theory in International Trade***, *Review of Economics and Statistics* 71, pp. 143-153;

[9] **Brülhart M. (1998),** ***Economic Geography, Industry Location and Trade: The Evidence***, The World Economy, Vol. 21;

[10] **Carrere C. (2006),** ***Revisiting the Effects of Regional Trading Agreements on Trade Flows with Proper Specification of Gravity Model***, *European Economic Review* vol. 50, 223-247;

[11] **Egger, P. and M. Pfaffermayr (2002),** ***The Pure Effect of European Integration on Intra-EU Core and Periphery Trade***, *University of Innsbruck Working Papers in Economics 2002/1*;

[12] **Fidrmuc J.D. Helmenstein G.&Wörgötter A. (1999),** ***East-West Intra-Industry Trade Dynamics***. *Weltwirtschaftliches Archiv*, 135 (2);

[13] Frankel, J. (1997), *Regional Trading Blocs in the World Economic System, Institute for International Economics*, Washington;

[14] **Hausman J.A. and Taylor, W.E. (1981),** ***Panel Data and Unobservable Individual Effects****, Econometrica*, 49, pp. 1377-1398;
[15] Helpman E. and Krugman P. **(1985),** ***Market Structure and Foreign Trade: Increasing Returns, Imperfect Competition, and the International Economy,*** *Cambridge MA/ London: MIT Press.;*
[16] **Heckscher E. (1919),** ***The Effect of Foreign Trade on the Distribution of Income***, Ekonomisk Tidskrift, pp.497-512;
[17] **Kaitila V. (1999),** ***Trade and Revealed Comparative Advantage: Hungary, the Czech Republic, and the European Union***. *BOFIT Discussion Papers*, 8;
[18] **Kmenta, J.(1986) ,** ***Elements of Econometrics***. New York: Macmillan; London: Collier Macmillan, 2nd Ed. pp. 605-620;
[19] **Krugman P. (1991),** ***Increasing Returns and Economic Geography.*** Journal of Political Economy, Vol. 99;
[20] **Linnemann H. (1966),** ***An Econometric Study of International Trade Flows***, *North Holland Publishing Company, Amsterdam*;
[21] **Matyas, L. (1997),** ***Proper Econometric Specification of the Gravity Model***, *The World Economies*, 20 (3), 363-368;
[22] **Ohlin B. (1933),** ***Interregional and International Trade***, Cambridge, MA: Harvard University Press;
[23] **Parks R.W. (1966),** ***Efficient Estimation of a System of Regression Equation when Disturbance are Both Serially and Contemporaneously Correlated***, in Journal of the American Statistical Association, 62, 500-509;
[24] **Pöyhönen P. (1963),** ***A Tentative Model for the Volume of Trade between Countries***, Weltwirschafliches Archiv, vol.90, pp.93-99;
[25] **Ricardo D. (1996),** ***Principles of Political Economy and Taxation***, Prometheus Books, 59 John Glenn Drive, Amherst, New York;
[26] **Rault C., Sova A., , Sova R. (2007),** ***The Endogeneity of Association Agreements and their Impact on Trade for Eastern Countries: Empirical Evidence for Romania****, William Davidson Institute Working Papers Series wp868*, William Davidson Institute at the University of Michigan Stephen M. Ross Business School, revised;
[27] **Rault C, Sova A., Sova R. (2008),** ***Modeling International Trade Flows between CEEC and OECD Countries****, Applied Economics Letters*, 1–8;
[28] **Ruxanda Gh., Stoian A. (2008),** ***Modelling of the Relationship between Foreign Direct Investment and Economic Growth,*** Economic Computation and Economic Cybernetics Studies and Research, vol. 42, 3-4 pp 49-62;
[29] **Tinbergen J. (1962),** ***Shaping the World Economy: Suggestions for an International Economic Policy,*** New York, NY: *Twentieth Century Fund*;
[30] **Wei, S.J, and Frankel, J.A. (1998),** ***Open Regionalism in a World of Continental Trade Blocs***, IMF Staff Papers, International Monetary Fund, vol. 45(3), pp. 2;
[34] **Wooldridge, J.H. (2005),** ***Introductory Econometrics: A Modern Approach***, 3rd Edition", *Thomson South-Western, ISBN 0-324-28978-2*;

APPENDIX A

Table 1: The results of econometric analysis without time effects

VARIABLES	FEM	REM	HT	FGLS
	(1)	(2)	(3)	(4)
	xij	xij	xij	xij
GDP_{it}	2.120	1.504	1.924	2.070
	(28.24)***	(31.46)***	(29.39)***	(23.23)***
GDP_{jt}	1.575	1.280	1.510	1.565
	(20.98)***	(26.76)***	(23.07)***	(15.97)***
$Dist_{ij}$	0.000	-1.170	-0.735	-0.960
	(.)	(9.19)***	(2.10)**	(21.20)***
$DGDPC_{ijt}$	0.279	0.172	0.313	0.289
	(1.74)*	(3.83)***	(2.53)**	(22.84)***
$Tchr_{ijt}$	-0.042	-0.036	-0.042	-0.037
	(12.26)***	(10.72)***	(12.29)***	(3.65)***
Acc_{ijt}	0.145	0.200	0.161	0.165
	(9.11)***	(12.49)***	(10.28)***	(8.16)***
Sc_{ij}	0.000	-0.210	-0.624	-0.381
	(.)	(3.62)***	(2.22)**	(18.79)***
Stb_{it}	0.203	0.192	0.199	0.223
	(11.45)***	(10.35)***	(11.26)***	(9.45)***
Rf_t	0.094	0.089	0.092	0.84
	(6.28)***	(5.72)***	(6.19)***	(9.57)***
Constant	-17.923	-9.686	-13.939	-14.711
	(35.58)***	(16.58)***	(12.14)***	(24.17)***
Observations	2128	2128	2128	2128
Number of groups	112	112	112	112
R-squared	0.76	0.80	-	0.95
Fischer (F)	36.90	-	-	-
Prob > F	(0.00)	-	-	-
Hausman test	-	260.51	-	-
Prob>chi2	-	(0.00)	-	-
Absolute value of t statistics in parentheses				
* significant at 10%; ** significant at 5%; *** significant at 1%				

Table 2: The results of econometric analysis with time effects

VARIABLE	FEM (1) xij	REM (2) xij	HT (3) xij	FGLS (4) xij
GDP_{it}	1.640	1.230	1.881	1.652
	(19.09)***	(24.80)***	(21.29)***	(13.08)***
GDP_{jt}	0.662	0.869	1.306	0.765
	(6.54)***	(16.71)***	(11.39)***	(9.54)***
$Dist_{ij}$	0.000	-1.350	-1.340	-1.304
	(.)	(10.86)***	(5.48)***	(19.96)***
$DGDPC_{ijt}$	0.254	0.175	0.265	0.259
	(3.53)***	(4.14)***	(3.86)***	(6.60)***
$Tchr_{ijt}$	-0.042	-0.036	-0.042	-0.032
	(12.76)***	(11.52)***	(12.76)***	(1.83)*
Acc_{ijt}	0.092	0.111	0.105	0.090
	(4.02)***	(4.76)***	(4.64)***	(4.74)***
Sc_{ijt}	0.000	-0.142	-0.137	-0.158
	(.)	(2.51)**	(0.70)	(6.40)***
Stb_{ijt}	0.159	0.166	0.162	0.149
	(8.15)***	(8.43)***	(8.38)***	(5.79)***
Rf	0.265	0.257	0.260	0.245
	(10.73)***	(10.73)***	(10.90)***	(7.42)***
t88	-0.115	-0.108	-0.109	-0.105
	(4.19)***	(3.87)***	(4.03)***	(3.06)***
t89	-0.230	-0.215	-0.220	-0.213
	(6.42)***	(6.05)***	(6.29)***	(5.88)***
t90	-0.236	-0.223	-0.227	-0.216
	(6.29)***	(6.09)***	(6.24)***	(6.11)***
t91	-0.238	-0.235	-0.235	-0.230
	(6.11)***	(6.19)***	(6.24)***	(6.24)***
t92	-0.223	-0.230	-0.226	-0.213
	(5.77)***	(6.16)***	(6.08)***	(5.88)***
t93	-0.250	-0.260	-0.255	-0.245
	(6.55)***	(7.00)***	(6.91)***	(6.50)***
t94	-0.177	-0.189	-0.183	-0.177
	(4.67)***	(5.06)***	(4.97)***	(4.60)***
t95	-0.160	-0.173	-0.168	-0.147
	(4.19)***	(4.55)***	(4.48)***	(6.17)***
t96	-0.191	-0.202	-0.197	-0.175
	(4.96)***	(5.28)***	(5.22)***	(7.98)***
t97	-0.155	-0.164	-0.161	-0.135
	(4.03)***	(4.26)***	(4.25)***	(3.07)***
t98	-0.141	-0.149	-0.146	-0.141
	(3.70)***	(3.86)***	(3.86)***	(3.72)***
t99	-0.147	-0.153	-0.150	-0.137
	(3.85)***	(3.96)***	(3.98)***	(3.86)***
t00	-0.135	-0.139	-0.138	-0.155
	(3.55)***	(3.60)***	(3.65)***	(3.65)***
t01	-0.109	-0.111	-0.110	-0.103
	(2.87)***	(2.87)***	(2.92)***	(2.85)***
t02	-0.057	-0.058	-0.058	-0.050
	(1.50)	(1.49)	(1.53)	(1.48)
t03	0.017	0.018	0.018	0.014
	(0.44)	(0.47)	(0.48)	(0.57)
t04	0.106	0.112	0.109	0.103
	(2.75)***	(2.89)***	(2.86)***	(4.17)***
t05	0.096	0.081	0.086	0.084
	(3.31)***	(2.78)***	(2.99)***	(10.32)***
Constant	-10.893	-5.565	-6.023	-6.684
	(14.29)***	(8.97)***	(6.12)***	(17.22)***
Observations	2128	2128	2128	2128
Number of groups	112	112	112	112
R-squared	0.79	0.82		0.95
Fischer (F)	38.17	-	-	-
Prob > F	(0.00)	-	-	-
Hausman test	-	81.17	-	-
Prob>chi2	-	(0.00)	-	-

Absolute value of t statistics in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

APPENDIX B

The evolution of the international trade between the last new EU' peripheral area (Romania and Bulgaria) and the core of EU

The analysis of the performance of the trade in aggregate and sectorial level is made on exports and imports. The aggregate level analysis focuses on the total trade to make an evaluation over time. The sectoiral analysis is focused on exports of countries in the new peripheral area, to identify labor-intensive sectors with the greatest weight that can be an argument for determinants "traditional" chosen by the econometric estimation. The international trade data, and their evolution during the period 1987 - 2005, are deferred in table 3→6. From table 6 we can conclude that for the countries of the new peripheral EU' area the labor intensive sectors have a major weight in their exports.

Table 3: Total commerce with EU (mil. $)

		1990	1995	2000	2005
Romania	Export	1906	4133	6666	15336
	Import	1681	4858	7935	21165
Bulgaria	Export	738	2194	2621	5764
	Import	1292	2680	2924	7533

Table 4: Romanian exports to European Union (mil. $)

	1990	1995	2000	2005
B	46	115	90	124
C	88	739	539	788
D	288	1739	3309	6459
E	57	471	576	1477
F	278	499	1428	4481
G	352	266	267	711
H	45	21	119	130
I	46	75	31	575
J	165	121	229	417
K	254	56	50	119

Table 5: Bulgarian export to European Union (mil. $)

	1990	1995	2000	2005
B	7	38	24	49
C	97	589	714	1233
D	119	509	880	1863
E	39	94	111	291
F	90	225	336	1053
G	88	312	223	314
H	16	66	66	147
I	58	36	65	278
J	105	138	75	266
K	103	157	106	223

Table 7: Sector codes

Code	Sector
B	Construction Materials
C	Iron and steel industry
D	Textile leather
E	Wood paper
F	Electrical Mechanics
G	Chemistry
H	Ores
I	Energy
J	Agriculture
K	Foodstuffs
NDA	NDA

Table 6. The weight of the sector in total export (%)

Country	Sector	1990	2005
Romania	B	3.4	0.6
	C	8.0	5.4
	D	28.2	37.1
	E	19.9	9.1
	F	9.3	34.8
	G	5.4	5.1
	H	0.2	1.3
	I	21.4	2.1
	J	2.4	2.8
	K	2.4	0.8
	NDA	0.2	0.8
Bulgaria	B	0.9	1.2
	C	13.2	23.5
	D	16.2	29.1
	E	5.2	4.6
	F	12.1	18.8
	G	11.9	5.2
	H	2.2	3.7
	I	7.8	4.7
	J	14.2	5.0
	K	14.0	3.0
	NDA	2.2	0.9