INTERNATIONAL TRADE
AND ECONOMIC CATCH-UP

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Abstract

International trade specialisation reflects differences in relative factor productivity and endowments, economies of scale or specific advantages of firms and it can have a significant impact on economic growth. We focus in this paper on trade specialisation dynamics in two Eastern European countries (Romania and Bulgaria – EEC-2) vis-à-vis the EU member states (EU-25). Specifically, we are interested to see whether there is a shift towards intra-industry trade leading to economic convergence and technological catch-up. We use recently developed static (FEM, REM and FEVD) and dynamic (GMM) panel data methods which take into account possible heterogeneity. Our empirical results indicate that intra-industry trade has indeed increased, but it is of the vertical rather than the horizontal type, resulting in complementary rather than competitive production patterns.

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1. Introduction

The EU enlargement, by bringing together developed and transition economies, was generally expected to result in higher intra-industry trade through technology transfers, and therefore to economic convergence, which is typical of regionalisation (see Lundberg, 1992). Economic integration also leads to the international diffusion of knowledge and convergence in the quality of traded goods, with a positive effect on exports. There is in fact a wide consensus in the literature that intra-industry trade is more conducive to economic growth than inter-industry trade, and that the former tends to take place between countries with similar factor endowments, to stimulate innovation and to exploit economies of scale (Helpman, 1987). Given the fact that there is a positive correlation between GDP growth and intensity of intra-industry trade, new EU members hoped to achieve higher growth rates and sustainable development as a result of an increase in intra-industry trade with the other members.

International trade specialisation reflects differences in relative factor productivity and endowments, economies of scale or specific advantages of firms. It is not neutral, and it can have a significant impact on economic growth. Countries that converge normally export products whose share in international trade is increasing. By contrast, those diverging typically exhibit inertia, and have comparative advantages in products whose share of world trade is stable or declining. Competitiveness is primarily a result of comparative advantages at the microeconomic level as well as of product innovation and differentiation.

Even after Romania and Bulgaria, two Eastern European countries (EEC-2 henceforth), became EU members in 2007, long-term economic convergence has remained an important goal for them. This paper analyses trade specialisation dynamics of a set of heterogeneous economies by exploiting recent advances in panel data econometrics. Our sample includes data on the EU-25 and the EEC-2, which have many similarities and entered the EU as part of the last wave of 2007. The issue of interest is whether EU membership has resulted in the EEC-2 continuing to specialise in inter-industry trade based on their comparative advantage resulting from lower labour costs, or instead their moving towards intra-industry specialisation which leads to economic convergence. Although convergence towards the other EU members is the aim of the EEC-2 countries, significant differences in labour costs and technological level may lead to a reallocation of labour-intensive industries from the EU to the EEC-2 as part of the international division of the production process.

Our analysis over the period 1990-2012 is based on economic indicators and the econometric estimation of a gravity model, which is suitable for both intra- and inter-industry trade. First, we examine trade patterns between the EEC-2 and the EU-25. Then we select an appropriate specification of the gravity model and carefully investigate the main determinants of trade flows between these two sets of countries. We use recently developed static and dynamic panel data methods, which explicitly take into account unobserved heterogeneity. Specifically, we use the fixed effect and random effect models (FEM and REM respectively) as well as the fixed effect vector decomposition (FEVD) technique proposed by Plümper and Troeger (2007), and the system Generalized Moment Method (GMM) estimator developed by Arellano and Bover (1995) and Blundel and Bond (1998).

The remainder of the paper is organised as follows. Section 2 provides some background information on trade flows between the EEC-2 and the EU-25. Section 3 discusses the gravity models representing the theoretical underpinning for the empirical analysis. Section 4 outlines the econometric model and reports the empirical results. Finally, Section 5 summarises the main findings and discusses their policy implications.

2. An overview of trade flows between the EEC-2 and EU countries

Trade patterns between the EEC-2 and the EU-25 countries are still characterised by significant asymmetries that are a heritage of the former communist system that followed an extensive rather than intensive development policy: until 1989, the former group of countries were centrally planned economies where trade was based on monopoly of international trade, import and export planning and currency inconvertibility. Hence, trade mainly took place within the Council for Mutual Economic Assistance. After the fall of the communist regime, these countries adopted instead an open system and Western Europe became one of their most important trade partners. However, trade openness towards Western Europe varied significantly across countries[5]. Geographical, historical and cultural links played an important role in the establishment of preferential relationships between the two zones. Our focus is on the evolution of trade patterns for the EEC-2 countries since they obtained access to a much wider market.

[5] The relevant index in 1989 is 19.3% for Romania and 18.4% for Bulgaria respectively.

2.1 Increasing but asymmetric trade flows

The framework for trade flows between the EEC-2 and EU is given by the European Agreement of 1993. Its implementation has led to a significant increase in trade volume between these two sets of countries, with both higher exports and imports. In Romania, the trade balance moved from a surplus to a deficit in 1992, and the latter grew over time. Bulgaria has experienced a deficit throughout[6]. By 2000, weights for trade flows to/from the EU-15 were very close to those for intra-European trade. However, the East-West relationship is asymmetrical as the EEC-2 only play a marginal role in total trade of the EU while the latter are their main partner. The trade deficit may reflect a lack of competitiveness of the EEC-2 products compared to the EU ones.

2.2 The reorientation of the EEC-2 trade and structural adjustment

Next, we examine whether the reorientation of trade towards the EU was accompanied by industrial structural adjustment and convergence in trade patterns.

In the case of Romania, until 2000, exports of labour intensive sectors dominate, due to the comparative advantage represented by low labour costs; subsequently, their importance has decreased relative to those of capital intensive industries[7]. Thus, in 2012, machinery, transport equipment, miscellaneous manufactured articles and basic manufactures became the three main export sectors. The recent increase in the volume of machinery, transport equipment exports may lead to an improvement in Romanian exports to the EU, but in general trade remains based on inter-sectoral complementarity.

A similar evolution can also be observed in Bulgaria, where the weights of the miscellaneous manufactured articles sector and of the machinery, transport equipment sectors have increased. In the other sectors there has been a fall of about 1%, and a sharp one in chemicals and related products. This can be seen as evidence of complementary specialisation.

[6] Bulgaria and Romania: our calculations using the Comtrade database

[7] "Apparel and clothing accessories" and "footwear" have decreased from 32% and 11% in 1996 to 14% and 6% respectively, while electric machinery and parts and road vehicles have increased from 3% and 2% to 14% and 9% respectively in 2012 (see Table 1).

Overall, it appears that changes have occurred in trade patterns between Romania and the EU, i.e. an increase in capital intensive exports, but in the case of Bulgaria exports are still of the labour-intensive type.

To shed further light on trade specialisation, we analyse some indicators of (i) comparative advantage and (ii) intra-industry trade.

2.3 Comparative advantages of the EEC-2

The analysis of sectoral trade adjustment is based on revealed comparative advantages calculations. Their evolution over time indicates whether trade pattern convergence has occurred.

Balassa (1965) was the first to propose indicators based on trade to measure international specialisation indirectly: he suggested to use export and import flows, and the trade balance. Here we use the indicator developed by Lafay (1990), where the trade balance is weighted by a country's GDP:

$$LFY_k = 100 \times \left[\frac{X_k - M_k}{X_k + M_k} - \frac{\sum_{k=1}^{K} (X_k - M_k)}{\sum_{k=1}^{K} (X_k + M_k)} \right] \times \frac{X_k + M_k}{\sum_{k=1}^{K} (X_k + M_k)} \qquad (1)$$

and where:

LFY_k = Lafay indicator;

X, M = total exports and imports;

X_{ik}, M_{ik} =exports and imports of product k;

PIB = gross domestic product.

This indicator measures the relative contribution of product k to the overall trade balance. A positive (negative) sign indicates the existence of a comparative advantage (disadvantage).

Table 2 shows the evolution of trade patterns over years of economic catch-up. The most important comparative advantages for Romania and Bulgaria concern the labour-intensive products, in particular miscellaneous manufactured articles (apparel and clothing accessories, footwear, and furniture). In the case of Romania, these increased until 2000 as a result of subcontracting from the EU-15 to the Eastern European countries, where wages are much lower. Apparel and clothing accessories appear to have the strongest comparative

advantage and the highest degree of specialisation (5.9%). After 2000, we note a decrease of the comparative advantage in these sectors. Generally, capital-intensive sectors have a comparative disadvantage. An example is the machinery, transport equipment sector: although its exports have increased, it still has a disadvantage, albeit a diminishing one over the period examined. The exception is given by electric machinery and parts, which by 2012 seem to have developed a comparative advantage. In the case of Bulgaria the comparative advantages of labour-intensive products have increased over time, as have the disadvantages of capital intensive products. The machinery, transport equipment sector has a greater disadvantage in Bulgaria than in Romania.

Overall, what emerges from the sectoral analysis is that trade specialisation for the two countries reflects the relatively large weight of labour-intensive products**.** Over time, there have been no major changes in export products, and technology-intensive industries with highly-skilled labour have not become competitive.

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2.4 Intra-industry trade and competitive pressures

International trade results not only from comparative advantages, which imply export and import flows of complementary products, i.e. inter-industry trade (IT), in accordance with classical theory. Intra-industry trade (IIT) also occurs, with simultaneous export and import flows of comparable size within the same industry.

Generally, regional integration of countries with different development levels leads to higher inter-industry trade (IT) based on complementary products but also to vertical intra-industry trade with specialisation in different segments of the production process, with a different unit cost. In our case, it is interesting to establish whether there has been an increase in intra-industry trade for the EEC-2 (Romania and Bulgaria). This is normally associated with economic catching-up, and should lead to integration of EU industrial patterns and hence convergence between the EEC-2 and the EU. A widely used measure of intra-industry trade is the traditional Grubel-Lloyd (GL) (1975) indicator. When this index is close to 1, intra-industry trade dominates, whilst, when the coefficient is close to 0, trade is predominantly of the inter-industry type.

The GL indicator is defined as follows:

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$$. GL = 1 - \frac{\sum_{k=1}^{N} \left| X_{ijkt} - M_{ijkt} \right|}{\sum_{k}^{N} (X_{ijkt} + M_{ijkt})} \qquad (2)$$

where :

X^k_{ijt} = exports of product industry ***k*** of country ***i*** towards country ***j*** in year ***t***

M^k_{ijt}= imports of product ***k*** country ***i*** from country ***j*** in year ***t***

A high share of intra-industry trade suggests advanced economic integration and a high level of industrial development, and can have significant long-term benefits. However, intra-industry trade by itself is not sufficient to characterise the level of technological development and competitiveness, an essential condition to cope with competitive pressures. Indeed, empirical studies have highlighted the existence of two types of intra-industry trade: horizontal and vertical. Horizontal trade is specific to countries which have a high level of development, with high prices incorporating research and development (R & D) costs and significant value added. Vertical intra-industry trade is specific to less developed countries, and it leads to specialisation in less capital-intensive production stages.

The results are reported in Table 3. There appears to be an increase in the GL index during the period under investigation, which indicates a growing importance of intra-industry trade. In 1990, inter-industry trade was dominant, but by 2012 the relative importance of intra-industry trade had increased significantly. However, the index by itself does not allow us to distinguish between vertical and horizontal intra-industry trade.

We use therefore the method due to Fontagné and Freudenberg (1997), who \distinguish between three types of trade (one-way trade or inter-industry trade, two-way trade in horizontally differentiated products trade, and two-way trade in vertically differentiated products trade) using a similarity criterion[8] and an overlap criterion[9]. For trade in horizontally differentiated products, the two criteria have to be fulfilled, whilst for the trade in vertically differentiated products only the overlap criterion has to be satisfied. The former concerns trade in similar products which are of the same quality but are differentiated by secondary characteristics (i.e. different varieties), while the latter concerns products of different quality which do not have the same unit value. Horizontal trade allows countries that are similar in

[8] Products are considered similar if they do not have different technical and qualitative characteristics, being adapted to consumer tastes.

[9] A trade flow is considered a two-way trade if the lower flow represents 10% of the larger flow. If not, trade is viewed as "one way" or inter-industry trade.

production factors to benefit from economies of scale by specialising in specific niches. Vertical trade may reflect different factor endowments, especially in terms of labour force skills or technology, and allows, for example, to use unskilled and cheap labour for assembly tasks or specialised staff for research and development activity.

One should also distinguish between intra-industry trade and the international division of production processes, i.e. trade at various stages of production. [10] For the latter, when analysing trade flows at the industry level the imports of an intermediate good and exports of a final good are interpreted as intra-industry trade, as exports and imports concern the same industry. By contrast, when analysing trade flows at the product level, trade for each product is only in one direction. There is, in fact, one-way trade of intermediate goods and of final products. However, this difference can only be detected empirically if trade flows are examined at a disaggregate (product) level rather than at the industry level. Therefore, simultaneous exports and imports within the same industry but at different stages of production should not be seen as intra-industry trade, but rather as international division of production processes (Fontagné and Freudenberg, 1997). At the aggregate level, intra-industry trade will also include intra-firm trade. Consequently, the share of intra-industry may be overestimated if the analysis is carried out at an insufficiently disaggregated level, owing to sectoral and geographical bias[11].

Using the method proposed by Fontagné et al. (1997, 2006), we distinguish first of all between one-way trade (inter-industry trade) and two-way trade (intra-industry). Trade is considered to be intra-industry when:

$$\frac{Min(X_{ij,kt}, M_{ij,kt})}{Max(X_{ij,kt}, M_{ij,kt})} > 10\% \quad (3)$$

After determining the existence of two-way trade we try to establish whether this concerns vertically or horizontally differentiated products by using the following formula:

$$1-\alpha \leq \frac{UV_{ij,kt}^{X}}{UV_{ij,kt}^{M}} \leq 1+\alpha \qquad (4)$$

where :

[10] E.g., imports of motor and exports of vehicles

[11] Geographical bias occurs when not all bilateral flows are taken into consideration and only a country's trade relations with "the rest of the world" are examined. Sectoral bias occurs when there is no sufficient disaggregation. The higher the number of products classified together in a single "industry", the bigger the overlap in trade and consequently the share of intra-industry trade.

α = value of unit dispersion (Aturupane et al. (1999) use a value of 0.15. By contrast, Fontagné et al. (2006) choose a value of 0.25).

$UV_{ij,kt}^{X}$ = unit export value;

$UV_{ij,kt}^{M}$ = unit import value;

where: X and M stand for exports and imports respectively; ***i*** and ***j*** are partner countries, ***k*** is the product and ***t*** stands for the year.

It is assumed that differences in prices (unit values) reflect quality differences. When unit values of products are close, i.e. the export and import unit values differ by less than 25%, these are considered as similar or horizontally differentiated (two-way trade of varieties) and satisfy the following condition:

$$0.75 \leq \frac{UV_{ij,kt}^{X}}{UV_{ij,kt}^{M}} \leq 1.25 \qquad (5)$$

Otherwise, traded products are vertically differentiated (two-way trade of qualities):

$$\frac{UV_{ij,kt}^{X}}{UV_{ij,kt}^{M}} \leq 0.75 \quad \text{and} \quad \frac{UV_{ij,kt}^{X}}{UV_{ij,kt}^{M}} \geq 1.25 \qquad (6)$$

Thus, on the basis of similarity in unit values and overlap in trade the three types of trade are characterised as follows: (i) one-way trade**:** insignificant overlap; (ii) trade in horizontally differentiated products: significant overlap and low unit value differences; (iii) trade in vertically differentiated products**:** significant overlap and high unit value differences.

The results using this method to measure intra-industry trade between the EEC-2 and the EU are presented in Tables 4a and 4b. As can be seen, in the case of Romania there has been an increase in intra-industry trade and a decrease in inter-industry trade over time. Trade in vertically differentiated products dominates trade in horizontally differentiated products, VIIT being the largest component of Romanian intra-industry trade. While HIIT has increased over time, it remains marginal. Thus, in 2012, VIIT represented 44.1% and HIIT only 21.3% of total trade with the EU. Similar results are obtained for Bulgaria. In 2012 intra-industry trade becomes dominant, the vertical intra-industry one being the main component of the trade. Thus, the trade patterns are based mainly on factor endowments.

Overall, the results are almost similar for both countries, i.e. inter-industry trade has decreased over time, whilst intra-industry trade has increased, but it concerns vertically differentiated products rather then horizontally differentiated ones. Intra-industry trade (IIT) weights (see Table 6a) indicate the importance of this type of trade between Romania and its traditional partners, Italy, France and Germany. Inter-industry trade, based on complementarities, characterises instead trade relations between Romania and Denmark, Belgium and to a lesser extent Ireland. In the case of Bulgaria, bilateral trade with Greece, Germany and France is mainly of the intra-industry type, whilst it is predominantly inter-industry with Ireland and Finland (see Table 6b). The share of inter-industry trade has increased with almost all EU partners at the expense of one-way trade.

As for trade patterns, food products. live animals, and crude materials are characterised by a high weight of inter-industry trade (50%), suggesting specialisation based on comparative advantage. By contrast, trade in machinery, transport equipment, chemicals and related products and mineral fuels is mainly of the intra-industry type. These sectors are dominated by vertical trade (see Tables 5a and 5b). Overall, our analysis highlights a shift towards intra-industry trade, especially of the vertical type, in the last period.

Next, we outline the gravity model which is used for the static and dynamic panel data analysis aimed at shedding more light on trade specialisation between the EEC-2 and the EU-25.

3. The gravity model

The gravity model is widely used as a benchmark to estimate trade flows between countries[12]. Trade flows from country ***i*** to country ***j*** are modelled as a function of supply of the exporter country, demand of the importer country and trade barriers. In other words, national incomes of two countries, transport costs (transaction costs) and regional agreements are the basic determinants of trade.

Initially inspired by Newton's gravity law, gravity models have become essential tools in the analysis of international trade flows. The first applications were rather intuitive, without theoretical foundations. These included the contributions of Tinbergen (1962) and Pöyhönen (1963). Subsequently, new international trade theory provided theoretical justifications for

[12] Eichengreen and Irwin (1995) consider the gravity model "the workhorse for empirical studies of regional integration".

these models in terms of increasing returns of scale, imperfect competition and geography (transport costs) (see Anderson 1979, Bergstrand 1985, and Helpman and Krugman 1985).

Linnemann (1966) proposed a gravity model based on a Walrasian, general equilibrium approach. 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 trade barriers. Potential export supply is a positive function of the exporting country's income level and can also be interpreted as a proxy for product variety. Potential import demand is a positive function of the importing country's income level. Barriers to trade are a negative function of trade costs, transport costs, and tariffs.

Bergstrand (1989) also included per capita income, which is an indicator of demand sophistication (demand for luxury versus necessity goods), and incorporated factor endowment variables in the spirit of Heckscher-Ohlin and taste variables in the spirit of Linder:

$$PX_{ij} = \Psi_0 (Y_i)^{\Psi_1} \left(Y_i / L_i \right)^{\Psi_2} (Y_j)^{\Psi_3} \left(Y_j / L_j \right)^{\Psi_4} (D_{ij})^{\Psi_5} (A_{ij})^{\Psi_6} e_{ij} \qquad (7)$$

where PX_{ij} represents flows from country *i* to country *j*, β_0 is the intercept, Y_i and Y_j are the GDP of country *i* and *j* respectively, (Y_i / L_i) and (Y_j / L_j) stand for GDP per capita of country ***i*** and ***j*** respectively, D_{ij} represents the geographical distance between the economic centres of two partners, A_{ij} factors aiding (e.g., common language and historical bonds) or representing a barrier to trade between partners.

Helpman (1987) used a model of trade in differentiated products to estimate the share of intra-industry trade (Grubel-Lloyd index for four-digit SITC groups) for separate cross sections of country pairs for 1970 to 1981:

$$S_{i-1}^{jk} = \alpha_0^{'} + \alpha_1^{'} \log \left| \frac{GDP^j}{N^j} - \frac{GDP^k}{N^k} \right| + \alpha_2^{'} \log \left(GDP^j + GDP^k \right) + \\ + \alpha_3^{'} \log \left[1 - \left(\frac{GDP^j}{GDP^j + GDP^k} \right)^2 - \left(\frac{GDP^k}{GDP^j + GDP^k} \right)^2 \right] \qquad (8)$$

where S_i^{jk} *is* the Grubel-Lloyd index (for four-digit SITC groups) in trade between countries *i* and *j*, *Y* and *y* are aggregate income and income per capita of countries. He found that the

share of intra-industry trade is negatively correlated with income differences and positively correlated with country size. Several other studies (Hummels and Levinsohn (1995), Evenett and Keller (2002) have reported similar results.

The gravity model has been widely used in the applied literature to evaluate the impact of regional agreements (see Frankel, 1997; Carrère, 2006; Rault et al., 2009, Caporale et al., 2009), the border effect on trade flows (Anderson and Van Wincoop, 2003), and trade potential (Baldwin, 1994; Peridy, 2005).

4. Econometric analysis

4.1. Methodological issues

The gravity model is the theoretical underpinning of the econometric framework we adopt. As heterogeneity plays an important role in bilateral flows, individual fixed effects are introduced into the empirical model to take it into account. One can also examine the evolution over time of countries' behaviour through temporal fixed effects (economic or political events).

Most studies estimating a gravity model apply the ordinary least square (OLS) method to cross-section data. Several papers have argued that standard cross-section methods lead to biased results because they do not take into account heterogeneity (e.g., historical, cultural and linguistic factors). Panel data methods are therefore preferable as they enable one to control for specific effects (such as fixed or random effects), and hence eliminate the potential endogeneity bias resulting from unobserved individual heterogeneity.

Matyas (1997) stresses that the cross-section approach is affected by misspecification and suggests that the gravity model should be specified as a "three-way model" with exporter, importer and time effects (random or fixed ones). Egger and Pfaffermayr (2003) underline that the omission of specific effects for country pairs can bias the estimated coefficients. An alternative solution is to use an estimator to control bilateral specific effects as in a fixed effect model (FEM) or in a random effect model (REM). The advantage of the former is that it allows for unobserved or misspecified factors that simultaneously explain the trade volume between two countries and lead to unbiased and efficient results.

Plümper and Troeger (2007) have proposed a more efficient method called "the fixed effect vector decomposition (FEVD)" to accommodate time-invariant variables. Using Monte Carlo simulations, they compared the performances of the FEVD method to some other

existing techniques, such as the fixed effect, or random effect, or the Hausman-Taylor methods. Their results indicate that the most reliable technique for small samples is FEVD if time-invariant variables are present and the other variables are correlated with specific effects, which is likely to be the case in our study (see the Appendix for more details).

In addition to FEM, REM, and FEVD, that are static panel data methods, we also use the Generalized Method of Moments (GMM) for dynamic panels of Arellano and Bover (1995) and Blundel and Bond (1998). This involves estimating a system containing both first–differenced and levels equations, providing a solution to problems such as simultaneity bias, inverse causality and omitted variables. Besides, this method controls for individual specific and time effects overcomes endogeneity bias. The model is well specified if the estimator is consistent (based on the Arellano-Bond AR(2) test) and the instruments are valid on the basis of Hansen's over-identification test.

4.2. Econometric results

Our aim is to analyse the trade specialisation dynamics of the EEC-2 vis-a-vis the EU-25 using a gravity model. Following the new trade theory (Helpman, 1987, Hummels and Levinsohn, 1995), we estimate a trade equation where differences in relative factor endowment ($DGDPT_{ij}$) and relative country size (RCS_{ij}) are the main determinants of the share of intra-industry trade. The bigger the difference between the partners' factor endowments, the lower the share of the intra-industry trade will be. The larger the measure of relative country size is, the higher the share of intra-industry trade. Helpman (1987) in fact found a positive correlation between the share of intra-industry trade and relative country size (interpreted as empirical support for the theory of returns to scale and imperfect competition in international trade), and a negative correlation with differences in relative factor endowments. After estimating the model over the whole sample, we also consider two subsamples in order to detect any sizeable changes in trade specialisation of the EEC-2 vis-a-vis the EU-25.

Model Specification

We model bilateral exports as a function of GDP, the difference in per capita income, relative country size and geographical distance. It is important to take into consideration both bilateral trade resistance (trade barriers between two countries) and multilateral trade resistance (i.e. trade barriers of each country with all its partners – see Anderson van Wincoop, 2003). Intuitively, a country has more incentives to trade with a partner when its

trade resistance with all other partners is higher. This results in price differences between countries, ignoring which may bias the estimates of all the other variables in the gravity equation. Following Baldwin and Taglioni (2006), we use time-varying nation dummies in order to obtain unbiased results by eliminating the potential bias due to the omission of multilateral trade resistance.

The total trade of each country is given by the sum of inter- and intra-industry trade volumes. The estimated equation is the following:

$$X_{ijt} = e^{a_0} GDPT_{ijt}^{a_1} DGDPT_{ijt}^{a_3} Dist_{ij}^{a_4} RCS_{ijt}^{a_5} \; Acc_{ijt}^{a_6} e^{u_{it}} e^{u_{jt}} \; e^{\varepsilon_{ijt}} \quad (9)$$

where: X_{ijt} denotes total trade between countries ***i*** and ***j*** at time ***t*** with i # j

a_o is the intercept;

- $GDPT_{ijt}$,= GDP_{it},+ GDP_{jt} stand for Gross Domestic Product of country ***i*** and country ***j*** (expected sign: positive)
- RCS_{ijt} is relative country size defined as follows (expected sign: positive for intra-industry trade):
- $$RCS_{ijt}^{(+)} = \left[1 - \left(\frac{GDP_{it}}{GDP_{it} + GDP_{jt}} \right)^2 - \left(\frac{GDP_{jt}}{GDP_{it} + GDP_{jt}} \right)^2 \right] \quad (11)$$

and 0 <Log RCS >0.5. The higher its value is, the higher the share of intra-industry trade.

- $DGDPT_{ijt}$ is the difference in GDP per capita between partners and is a proxy for economic distance or comparative advantage intensity(expected sign: positive for inter- and negative for intra-industry trade)
- $DIST_{ij}$= geographical distance between two countries
- Acc_{ijt} is a dummy variable that equals 1 if country ***i*** and country ***j*** have signed a regional agreement, and zero otherwise (a positive correlation between this variable and intra-industry trade is expected)
- ε_{ijt} is the error term,
- u_{it} is time varying dummies for exporter ***i***
- u_{jt} is time varying dummies for importer ***j***

After log-linearisation, equation (9) becomes the following in a static context:

$$Log(X_{ijt}) = a_0 + a_1 \log(GDPT_{ijt}) + a_2 \log\left(DGDPT_{ijt}\right) + a_3 \log(DIST_{ij}) + a_4 \log\left(RCS_{ijt}\right) + \\ + a_5 Acc_{ijt} + u_{it} + u_{jt} + \varepsilon_{ijt} \quad (12)$$

or, in a dynamic context:

$$Log(X_{ijt}) = a_0 + a_1 \log(X_{ijt-1}) + a_2 \log(GDPT_{ijt}) + a_3 \log\left(DGDPT_{ijt}\right) + a_4 \log(DIST_{ij}) + \\ + a_5 \log\left(RCS_{ijt}\right) + a_6 Acc_{ijt} + \nu_t + \varepsilon_{ijt} \quad (13)$$

Our panel includes the EEC-2 and the EU-25 countries[13]. The data are annual, and the sample period is 1990-2012. The model is estimated over the whole period, and also for two subperiods (1990-1999 and 2000-2012). As a robustness check, we use all the estimation methods previously outlined.

Results

The estimation results using REM, FEM and FEVD are reported in Table 7a and those using GMM and Table 7b.The results based on FEVD and FEM are similar, which indicates robustness of our estimates, and highlight the effects of the time-invariant variables on trade flows. For our static panel data analysis, FEVD is more appropriate given the sample size, and has a higher R^2, equal to 0.90 (see Table 7a).

In all cases, the variables are significant and have the expected sign, consistent with the gravity model. Access to a larger market increases trade volume. On the contrary, the distance variable (a proxy for transportation costs) reduces trade. Owing to differences in factor endowments and relative country size inter-industry trade dominates in the first period, which was a transition period with significant economic changes and adjustments. The impact of $DGDPT_{ij}$ on total trade, especially the inter-industry trade, is positive. By contrast, in the second period it becomes negative and insignificant. The impact of RCS_{ijt} remains negative and significant in the second period, although its coefficient is not as large as in the first one. The period from 2000 is characterised by an increasing role of multinational firms in the markets of both countries and a higher growth rate.

The GMM estimates (see Table 7b) appear to be consistent, there is no residual autocorrelation, and the validity of the instruments is confirmed by Hansen's test. The coefficients are all statistically significant and with the expected signs. On the whole, the results obtained in a dynamic framework are consistent with the static ones.

[13] *EU-15*: Austria, Belgium, Cyprus, Czech Republic, Denmark, England, Estonia, Finland, France, Germany, Greece, Holland, Hungary, Ireland, Italy, Latvia, Lithuania, Luxemburg, Malta, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden.

5. Conclusions

In this paper, we have investigated trade specialisation of the EEC-2 vis-à-vis the EU-25 over the period 1990-2012 using economic indicators and both static and dynamic panel data techniques which take into account heterogeneity and hence avoid biased estimates. Specifically, we have examined whether there has been a shift towards intra-industry trade, necessary for economic convergence and technological catch-up. Our findings can be summarised as follows.

Trade volumes (both exports and imports) have increased significantly since the signing in 1993 of the European Agreement with the EU. By 2000, the volume of trade with the EU had become similar to the volume of intra-European trade, indicating trade integration. In general, exports are dominated by products with labour-intensive comparative advantages. In the period 2000-2012, there was an increase (more for Romania than for Bulgaria) of exports of products with higher value added, incorporating physical capital and skilled labour, but no significant changes in competitiveness such as to improve the trade balance.

In the course of their integration process, the EEC-2 exhibit a comparative advantage in labour-intensive production segments and a comparative disadvantage in capital-intensive sectors. Our results indicate a shift towards intra-industry trade, specifically of the vertical type. According to Hoekman and Djankov (1996), higher FDI is behind increasing vertical intra –industry trade between CEEC and EU countries. Kaitila (1999) found that intra-industry trade between the transition countries and the core EU is low compared to intra-industry trade within the EU, but has increased as a result of trade pattern changes

Vertical intra-industry trade increases production and labour productivity, but does not lead to economic convergence, which is associated instead with horizontal intra-industry trade, i.e. simultaneous export and import flows of comparable size of products with similar quality, technology and value added. In other words, in the context of European integration, the EEC-2 have followed the strategy of exploiting their comparative advantage of low labour costs in the context of the international division of production processes, although some sectors with high value added (e.g., electric and mechanics) have also expanded. However, the risk for countries such as Bulgaria and Romania with labour-intensive sectors is that the development of inter-industry and vertical intra-industry trade will perpetuate trade specialisation based on the exploitation of low wages. Therefore, the challenge for Romania

and Bulgaria is to change their production patterns from complementary to competitive and move towards international market segments with high quality and high value-added products, thereby accelerating convergence towards the EU.

References

[1] Anderson J E. A theoretical foundation for the gravity equation. American Economic Review 1979; 69(1); 106-16

[2] Anderson J E, Van Wincoop E. Gravity with gravitas: a solution to the border effect puzzle. American Economic Review 2003 ; 93(1) ; 170-192

[3] Andreff M La spécialisation du commerce entre l'Union européenne et les pays d'Europe centrale et orientale : quelle évolution ?. Revue d'études comparatives EST/OUEST 1998; 29(4); 161-189

[4] Arellano M, Bond S. Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equation. Review of Economic Studies 1991;58;277-297.

[5] Arellano M, Bover O. Another Look at the instrumental variables Estimation of Error-Component Models. Journal of Econometric1995; 68; 29-51

[6] Aturupane C, Djankov S, Hoekman B. Horizontal and Vertical Intra-Industry Trade between Eastern Europe and the European Union. Weltwirtschaftliches Archiv Kiel 1999; 135(1); 63-81

[7] Balassa B. Trade Liberalisation and 'Revealed' Comparative Advantage. Manchester School of Economics and Social Studies 1965; 33; 99-123

[8] Baldwin, R. Taglioni, D. Gravity for Dummies and Dummies for Gravity Equations, NBER Working Paper 2006/12516

[9] Baldwin R. Towards an integrated Europe, CEPR London 1994

[10] Bergstrand J H. The generalized gravity equation, monopolistic competition, and the factor-proportions theory in international trade. Review of Economics and Statistics 1989; 71(1); 143-53

[11] Bergstrand J H. The gravity equation in international trade: some microeconomic foundations and empirical evidence. Review of Economics and Statistics 1985; 67(3); 474-81

[12] Blundel R, Bond S. Initial Contitions and Moment Restrictions in Dinamic Panel Data Models. Journal of Econometrica 1998; 87(1); 115-143–1998.

[13] Caporale G.M., Rault C., Sova R., Sova A. On the bilateral trade effects of free trade agreements between the UE-15 and the CEEC – 4 countries. Review of World Economics 2009; 145(2); 189-206.

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

[15] Egger P, Pfaffermayr M. The proper panel econometric specification of the gravity equation: a three-way model with bilateral interaction effects. Empirical Economics 2003; 28; 571-580

[16] Eichengreen B, Irwin D A. Trade blocs, currency blocs and the reorientation of world trade in the 1930s. Journal of International Economics 1995;38(1-2);1-24

[17] Evenett, S.J, Keller W. On Theories Explaining the Success of the Gravity Equation. Journal of Political Economy 2002; 110 (2); 281-316.

[18] Fontagne L, Freudenberg M. Intra-Industry Trade: Methodological Issues Reconsidered Working Papers CEPII Research Center 1997; 01

[19] Fontagné L., Freudenberg M., Gaulier G. A Systematic Decomposition of World Trade into Horizontal and Vertical IIT. Review of World Economics 2006; 142(3); 459-475.

[20] Frankel J. Regional trading blocs in the world economic system. Institute for International Economics Washington 1997

[21] Grubel H G, Lloyd P J. Intra-industry trade: the theory and measurement of international trade in differencial products. Macmillan London 1975;

[22] Helpman E, Krugman P R. Market Structure and Foreign Trade: Increasing Returns, Imperfect Competition, and the International Economy. Cambridge/Mass.: MIT Press, 1985

[23] Helpman E. Imperfect Competition and International Trade: Evidence from Fourteen Industrial Countries. Journal of the Japanese and International Economies 1987; 1; 62-81

[24] Hoeckman B, Djankov S. Intra-Industry Trade, Foreign Direct Investment and the Reorientation of East European Exports. CEPR London Discussion Paper 1996;1377

[25] Hummels D, Levinsohn J. Monopolistic Competition and International Trade: Reconsidering the Evidence Quarterly Journal of Economics 1995; 110; 798-836

[26] Kaitila V. Trade and Revealed Comparative Advantage: Hungary, the Czech Republic, and the European Union. BOFIT Discussion Papers 1999(8)

[27] Lafay G. La mesure des avantages comparatifs révélés. Économie prospective internationale 1990;41

[28] Linnemann H. An econometric Study of International Trade Flows. North Holland, Amsterdam 1966

[29] Lundberg L.Economic Integration, Inter- and Intra-industry Trade: the Case of Sweden and the EC. Scandinavian Journal of Economics 1992; 94(3); 393-408

[30] Matyas L. Proper Econometric Specification of the Gravity Model. The World Economy 1997 20(3); 363-368

[31] Péridy N. Towards a New Trade Policy Between the USA and Middle-East Countries:

Estimating Trade Resistance and Export Potential. World Economy 2005; 28(4); 491-518
[32] Plumper, T. and Troeger, V.E. (2007). "Efficient Estimation of Time-Invariant and Rarely Changing Variables in Finite Sample Panel Analyses with Unit Fixed Effects", *Political Analysis* 15(2), 124-139.
[33] Pöyhönen P. A Tentative Model for the Volume of Trade between Countries, Welwirtschftliches Archiv, 1963; 90(1); 93-99
[34] Rault C, Sova R, Sova A. Modeling international trade flows between CEEC and OECD countries. Applied Economics Letters 2009; 16(15);1547-1554.
[35] Tinbergen J. Shaping the World Economy: Suggestions for an International Economic Policy. The Twentieth Century Fund New York 1962

Table 1: Exports and imports weights for EEC-2 (2 digit level)

Code	Text	Romania		Bulgaria	
		% EXP	%IMP	% EXP	% IMP
00	Live animals	0.5%	0.2%	0.2%	0.1%
01	Meat and meat preparations	0.4%	1.9%	1.3%	2.2%
02	Dairy products and birds' eggs	0.2%	0.3%	0.5%	0.6%
03	Fish and fish preparations	0.1%	0.3%	0.0%	0.2%
04	Cereals and cereal preparations	0.5%	0.5%	1.6%	0.4%
05	Vegetables and fruit	0.4%	0.8%	1.4%	1.2%
06	Sugars,sugar preparations and honey	0.2%	0.2%	0.6%	0.4%
07	Coffee,tea,cocoa,spices	0.0%	0.6%	0.2%	0.9%
08	Feeding stuff for animals	0.1%	0.1%	0.4%	0.3%
09	Miscellaneous edible products and preparations	0.1%	0.5%	0.1%	0.5%
11	Beverages	0.2%	0.5%	0.3%	0.6%
12	Tobacco and tobacco manufactures	1.3%	0.2%	1.5%	0.4%
21	Hides,skins,furskins,raw	0.2%	0.0%	0.1%	0.0%
22	Oil seeds,oleaginous fruits	2.7%	1.2%	4.6%	1.8%
23	Crude rubber (incl.synthetic)	0.0%	0.2%	0.2%	0.1%
24	Cork and wood	0.5%	0.3%	0.6%	0.2%
25	Pulp and waste paper	0.1%	0.2%	0.1%	0.1%
26	Textile fibres and their wastes	0.2%	0.4%	0.3%	0.7%
27	Crude fertilizers and crude minerals	0.1%	0.1%	0.5%	0.2%
28	Metalliferous ores and metal scrap	1.3%	0.3%	2.6%	0.3%
29	Crude animal,vegetable materials n.e.s.	0.4%	0.5%	0.3%	0.5%
32	Coal,coke and briquettes	0.2%	0.0%	0.0%	0.1%
33	Petroleum and products	0.1%	0.0%	0.0%	0.0%
34	Gas,natural and manufactured	0.1%	0.1%	0.0%	0.2%
35	Electric current	0.2%	0.1%	2.5%	0.0%
41	Animal oils and fats	0.1%	0.2%	0.0%	0.2%
42	Fixed vegetable fats and oils	0.2%	0.2%	0.3%	0.4%
43	Processed animal or vegetable oils,etc.	0.1%	0.1%	0.4%	0.2%
51	Organic chemicals	0.7%	0.7%	1.5%	0.7%
52	Inorganic chemicals	0.6%	0.3%	0.6%	0.1%
53	Dyeing,tanning and colouring material	0.2%	1.0%	0.1%	1.2%
54	Medicinal and pharmaceutical products	0.2%	3.5%	0.4%	3.1%
55	Perfume,cleaning etc.preparations	0.0%	1.2%	0.6%	1.5%
56	Fertilizers,manufactured	1.0%	0.1%	0.8%	0.2%
57	Plastics in primary forms	1.0%	1.9%	0.4%	1.7%
58	Plastics in non-primary forms	0.2%	1.7%	0.2%	1.9%
59	Chemical materials and products,n.e.s.	0.1%	1.6%	0.1%	1.4%
61	Leather,dressed fur,etc.	0.3%	1.5%	0.1%	0.6%

Code	Text	% EXP	%IMP	% EXP	% IMP
62	Rubber manufactures,n.e.s.	2.5%	1.4%	0.5%	0.7%
63	Wood and cork manufactures	1.7%	0.5%	0.9%	0.4%
64	Paper,paperboard and articles thereof	0.2%	1.3%	0.3%	1.4%
65	Textile yarn,fabrics,made up articles,etc.	2.9%	6.2%	3.1%	6.1%
66	Non-metallic mineral manufactures,n.e.s.	0.5%	1.2%	1.9%	1.5%
67	Iron and steel	5.4%	3.1%	4.2%	3.2%
68	Non-ferrous metals	1.7%	1.7%	17.5%	1.4%
69	Manufactures of metals,n.e.s.	3.0%	4.2%	2.3%	3.1%
71	Power generating machinery and equipment	1.7%	1.7%	1.7%	1.5%
72	Machinery for specialized industries	1.3%	5.1%	1.3%	7.2%
73	Metal working machinery	0.6%	1.5%	0.6%	1.4%
74	General industrial machinery n.e.s.	5.4%	6.8%	3.2%	7.1%
75	Office machines and adp machines	1.5%	2.8%	0.1%	2.5%
76	Telecommunications and sound recording equipm	2.3%	2.4%	1.4%	3.1%
77	Electric machinery,n.e.s.and parts	14.1%	8.7%	6.5%	5.9%
78	Road vehicles	9.1%	14.3%	0.7%	12.0%
79	Other transport equipment	2.5%	0.9%	0.4%	1.3%
81	Prefabr.buildings;sanitary,lighting etc.fixtrs	0.6%	0.8%	0.5%	0.5%
82	Furniture and parts thereof	4.5%	0.7%	1.8%	0.8%
83	Travel goods,handbags and sim.containers	0.3%	0.2%	0.4%	0.2%
84	Articles of apparel and clothing accessories	14.3%	1.6%	16.3%	2.9%
85	Footwear	5.7%	1.2%	2.2%	0.5%
87	Instruments and apparates n.e.s.	0.6%	1.5%	1.8%	1.6%
88	Photographic equipment,optical goods etc.	0.0%	0.2%	0.4%	0.5%
89	Miscellaneous manufactured articles,n.e.s.	1.4%	2.0%	1.5%	2.4%
91	Postal packages not classified according to kind	0.0%	0.0%	0.0%	0.0%
93	Special transactions and commodities not classified	2.1%	3.4%	1.8%	4.2%
96	Coin (not gold coin or legal)	0.0%	0.0%	0.0%	0.0%
97	Gold,non-monetary	0.0%	0.0%	0.0%	0.0%

Table 2: Revealed comparative advantages (Lafay indicator – 2 digit level)

Code	Text	Romania		Bulgaria	
		1996	2012	1996	2012
00	Live animals	0.30	0.25	0.03	0.02
01	Meat and meat preparations	0.10	-0.73	0.64	-0.26
02	Dairy products and birds' eggs	-0.16	-0.16	0.01	0.08
03	Fish and fish preparations	-0.08	-0.09	-0.13	-0.04
04	Cereals and cereal preparations	-0.23	0.12	-0.10	0.61
05	Vegetables and fruit	0.26	-0.25	0.66	0.17
06	Sugars,sugar preparations and honey	-0.14	-0.03	0.19	0.04
07	Coffee,tea,cocoa,spices	-0.21	-0.24	-0.18	-0.29
08	Feeding stuff for animals	-0.09	-0.05	-0.17	0.04
09	Miscellaneous edible products and preparations	-0.56	-0.20	-0.07	-0.26
11	Beverages	0.21	-0.17	1.68	-0.27
12	Tobacco and tobacco manufactures	-0.35	0.38	0.26	0.32
21	Hides,skins,furskins,raw	-0.03	0.07	0.02	0.03
22	Oil seeds,oleaginous fruits	-0.10	0.91	1.64	1.23
23	Crude rubber (incl.synthetic)	-0.09	-0.09	0.32	-0.04
24	Cork and wood	0.36	0.23	0.62	0.21
25	Pulp and waste paper	-0.03	-0.04	0.25	0.09
26	Textile fibres and their wastes	-0.32	-0.20	-1.06	-0.08
27	Crude fertilizers and crude minerals	-0.10	-0.05	0.28	0.04
28	Metalliferous ores and metal scrap	-0.27	0.35	0.10	0.87
29	Crude animal,vegetable materials n.e.s.	0.04	-0.18	0.43	-0.07
32	Coal,coke and briquettes	0.06	-0.03	-0.01	-0.05
33	Petroleum and products	0.00	0.00	0.00	0.00
34	Gas,natural and manufactured	-0.01	0.03	0.00	-0.11
35	Electric current	0.00	0.08	0.00	1.30
41	Animal oils and fats	0.00	-0.05	0.00	-0.06
42	Fixed vegetable fats and oils	-0.06	0.00	-0.05	0.04
43	Processed animal or vegetable oils,etc.	-0.04	-0.04	-0.15	-0.04
51	Organic chemicals	-0.05	-0.05	-0.15	0.37
52	Inorganic chemicals	-0.03	0.07	0.95	0.23
53	Dyeing,tanning and colouring material	-0.80	-0.38	-0.76	-0.45
54	Medicinal and pharmaceutical products	-0.65	-1.76	-0.80	-1.34
55	Perfume,cleaning etc.preparations	-0.66	-0.61	-1.09	-0.45
56	Fertilizers,manufactured	0.69	0.36	2.54	0.33
57	Plastics in primary forms	0.19	-0.29	-0.05	-0.61
58	Plastics in non-primary forms	-0.53	-0.61	-0.64	-0.69
59	Chemical materials and products,n.e.s.	-1.14	-0.77	-1.58	-0.65

Code	Text	ROM		BGR	
		1996	2012	1996	2012
61	Leather,dressed fur,etc.	-1.77	-0.72	-0.68	-0.32
62	Rubber manufactures,n.e.s.	0.11	0.52	-0.08	-0.17
63	Wood and cork manufactures	0.23	0.36	0.26	-0.09
64	Paper,paperboard and articles thereof	-0.75	-0.53	-2.00	-0.51
65	Textile yarn,fabrics,made up articles,etc.	-7.16	-1.89	-4.54	-1.38
66	Non-metallic mineral manufactures,n.e.s.	0.35	-0.46	0.15	-0.04
67	Iron and steel	3.17	0.93	4.06	0.41
68	Non-ferrous metals	1.34	0.06	3.73	7.81
69	Manufactures of metals,n.e.s.	-0.41	-0.67	-0.49	-0.39
71	Power generating machinery and equipment	0.19	0.05	0.35	0.40
72	Machinery for specialized industries	-4.47	-1.89	-1.93	-2.92
73	Metal working machinery	-0.02	-0.26	0.34	-0.21
74	General industrial machinery n.e.s.	-3.34	-0.47	-1.79	-1.76
75	Office machines and adp machines	-1.00	-0.49	-1.09	-1.18
76	Telecommunications and sound recording equipment	-0.98	0.00	-1.11	-0.85
77	Electric machinery,n.e.s.and parts	-1.11	2.71	-1.61	0.24
78	Road vehicles	-0.54	-2.68	-2.37	-5.62
79	Other transport equipment	0.76	1.07	0.49	-0.22
81	Prefabr.buildings;sanitary,lighting etc.fixtrs	-0.10	0.01	-0.07	0.03
82	Furniture and parts thereof	3.75	1.85	0.23	0.52
83	Travel goods,handbags and sim.containers	0.13	0.17	0.29	0.18
84	Articles of apparel and clothing accessories	14.28	5.92	4.67	6.65
85	Footwear	4.23	2.14	1.23	0.62
87	Instruments and apparates n.e.s.	-1.02	-0.34	-1.20	0.29
88	Photographic equipment,optical goods etc.	-0.17	-0.09	-0.14	0.05
89	Miscellaneous manufactured articles,n.e.s.	-1.20	-0.73	-0.54	-0.51
91	Postal packages not classified according to kind	0.00	0.00	0.00	0.00
93	Special transactions and commodities not classified	0.00	-0.31	0.25	-1.21
96	Coin (not gold coin or legal)	0.00	0.00	0.00	0.00
97	Gold,non-monetary	0.00	0.00	0.00	-0.01

Source: Our calculations using the Comtrade database

Table 3: Grubel-Lloyd indicator for the main sectors (2-digit level)

Code	Text	ROM		BGR	
		1996	2012	1996	2012
00	Live animals	0.38	0.53	0.63	0.74
01	Meat and meat preparations	0.51	0.24	0.20	0.61
02	Dairy products and birds' eggs	0.14	0.22	0.92	0.91
03	Fish and fish preparations	0.06	0.10	0.45	0.29
04	Cereals and cereal preparations	0.26	0.96	0.29	0.55
05	Vegetables and fruit	0.79	0.37	0.58	0.95
06	Sugars,sugar preparations and honey	0.51	0.73	0.46	0.91
07	Coffee,tea,cocoa,spices	0.02	0.11	0.41	0.23
08	Feeding stuff for animals	0.56	0.49	0.01	0.90
09	Miscellaneous edible products and preparations	0.02	0.31	0.86	0.18
11	Beverages	0.33	0.40	0.11	0.27
12	Tobacco and tobacco manufactures	0.00	0.57	0.76	0.72
21	Hides,skins,furskins,raw	0.21	0.49	0.13	0.49
22	Oil seeds,oleaginous fruits	0.85	0.71	0.27	0.75
23	Crude rubber (incl.synthetic)	0.30	0.07	0.52	0.51
24	Cork and wood	0.15	0.62	0.04	0.35
25	Pulp and waste paper	0.03	0.35	0.40	0.51
26	Textile fibres and their wastes	0.25	0.36	0.35	0.67
27	Crude fertilizers and crude minerals	0.06	0.32	0.39	0.96
28	Metalliferous ores and metal scrap	0.07	0.67	0.71	0.41
29	Crude animal,vegetable materials n.e.s.	0.85	0.24	0.26	0.58
32	Coal,coke and briquettes	0.59	0.00	0.23	0.14
33	Petroleum and products	0.00	0.00	0.00	0.00
34	Gas,natural and manufactured	0.00	0.69	0.45	0.03
35	Electric current	0.00	0.00	0.00	0.02
41	Animal oils and fats	0.30	0.00	0.83	0.23
42	Fixed vegetable fats and oils	0.16	0.79	0.05	0.94
43	Processed animal or vegetable oils,etc.	0.48	0.23	0.15	0.31
51	Organic chemicals	0.84	0.70	0.97	0.76
52	Inorganic chemicals	0.82	0.96	0.39	0.67
53	Dyeing,tanning and colouring material	0.02	0.15	0.11	0.12
54	Medicinal and pharmaceutical products	0.40	0.06	0.70	0.18
55	Perfume,cleaning etc.preparations	0.02	0.04	0.24	0.31
56	Fertilizers,manufactured	0.00	0.43	0.02	0.68
57	Plastics in primary forms	0.95	0.62	0.99	0.30
58	Plastics in non-primary forms	0.02	0.23	0.28	0.25
59	Chemical materials and products,n.e.s.	0.09	0.08	0.12	0.17

Code	Text	ROM		BGR	
		1996	2012	1996	2012
61	Leather,dressed fur,etc.	0.12	0.25	0.54	0.15
62	Rubber manufactures,n.e.s.	0.97	0.95	0.93	0.65
63	Wood and cork manufactures	0.80	0.83	0.69	0.72
64	Paper,paperboard and articles thereof	0.28	0.27	0.21	0.35
65	Textile yarn,fabrics,made up articles,etc.	0.15	0.42	0.51	0.51
66	Non-metallic mineral manufactures,n.e.s.	0.94	0.35	0.89	0.75
67	Iron and steel	0.52	0.97	0.36	0.90
68	Non-ferrous metals	0.48	0.82	0.27	0.23
69	Manufactures of metals,n.e.s.	0.72	0.60	0.83	0.65
71	Power generating machinery and equipment	0.96	0.80	0.70	0.89
72	Machinery for specialized industries	0.12	0.27	0.36	0.25
73	Metal working machinery	0.86	0.56	0.61	0.56
74	General industrial machinery n.e.s.	0.33	0.71	0.65	0.47
75	Office machines and adp machines	0.03	0.58	0.18	0.12
76	Telecommunications and sound recording equipment	0.12	0.79	0.08	0.45
77	Electric machinery,n.e.s.and parts	0.61	0.95	0.60	0.82
78	Road vehicles	0.63	0.56	0.36	0.10
79	Other transport equipment	0.44	0.59	0.38	0.51
81	Prefabr.buildings;sanitary,lighting etc.fixtrs	0.70	0.74	0.80	0.82
82	Furniture and parts thereof	0.21	0.36	0.72	0.81
83	Travel goods,handbags and sim.containers	0.28	0.62	0.33	0.54
84	Articles of apparel and clothing accessories	0.21	0.39	0.41	0.42
85	Footwear	0.38	0.49	0.65	0.72
87	Instruments and apparates n.e.s.	0.13	0.48	0.18	1.00
88	Photographic equipment,optical goods etc.	0.21	0.25	0.61	0.92
89	Miscellaneous manufactured articles,n.e.s.	0.43	0.47	0.76	0.54
91	Postal packages not classified according to kind	0.00	0.00	0.00	0.00
93	Special transactions and commodities not classified	0.00	0.68	0.37	0.42
96	Coin (not gold coin or legal)	0.00	0.00	0.00	0.00
97	Gold,non-monetary	0.00	0.00	0.00	0.07
	TOTAL 0.37		**0.59**	**0.46**	**0.47**

Source:Our calculations using the Comtrade database

Table 4(a): evolution of trade types of Romania with the EU

Trade type		1990	1996	2000	2012
Inter-industry IT		77.7%	72.4%	68.8%	34.6%
Intra-industry IIT		22.3%	27.6%	31.2%	65.4%
Horizontal HIIT		1.8%	5.9%	7.8%	21.3%
Vertical VIIT		20.5%	21.7%	23.4%	44.1%

Source: Our calculations using the Comtrade database

Table 4(b): evolution of trade types of Bulgaria with the EU (%),

Type de commerce		1996	2000	2012
Inter-industriel IT		63.4%	52.2%	37.0%
Intra-industriel IIT		36.6%	47.8%	63.0%
Horizontal HIIT		2.4%	10.5%	16.3%
Vertical VIIT		56.2%	37.3%	46.7%

Source: Our calculations using the Comtrade database

Table 5(a): Main horizontally and vertically differentiated products traded between Romania and the EU (3-digit level)

HIIT	ROMANIA		
Code	Text	SIM	MIN_MAX
513	Carboxylic acids and their anhydrides, halides, peroxides and peroxyacids; their halogenated, sulphonated, nitrated or nitrosated derivatives	0.82	0.49
574	Polyacetals, other polyethers and epoxide resins, in primary forms; polycarbonates, alkyd resins, polyallyl esters and other polyesters, in primary forms	0.80	0.64
582	Plates, sheets, film, foil and strip, of plastics	0.87	0.12
625	Rubber tyres, interchangeable tyre treads, tyre flaps and inner tubes for wheels of all kinds	1.00	0.35
761	Monitors and projectors, not incorporating television reception apparatus; reception apparatus for television, whether or not incorporating radio-broadcast receivers or sound or video recording or reproducing apparatus	1.04	0.17
764	Telecommunications equipment, n.e.s., and parts, n.e.s., and accessories of apparatus falling within division 76	0.90	0.72
775	Household-type electrical and non-electrical equipment, n.e.s.	1.16	0.60
778	Electrical machinery and apparatus, n.e.s.	0.78	0.65
785	Motor cycles (including mopeds) and cycles, motorized and non-motirized; invalid carriages	1.15	0.48
821	Furniture and parts thereof; bedding, mattresses, mattress supports, cushions and similar stuffed furnishings	0.82	0.26
VIIT-LQ	**ROMANIA**		
Code	Text	SIM	MIN_MAX
43	Barley, unmilled	0.44	0.67
44	Maize (not including sweet corn), unmilled	0.21	0.75
45	Cereals, unmilled (other than wheat, rice, barley and maize)	0.09	0.32
59	Fruit juices (including grape must) and vegetable juices, unfermented and not containing added spirit, whether or not containing added sugar or other sweetening matter	0.53	0.25
81	Feeding stuff for animals (not including unmilled cereals)	0.18	0.31
111	Non-alcoholic beverages, n.e.s.	0.37	0.20
211	Hides and skins (except furskins), raw	0.45	0.34
223	Oil-seeds and oleaginous fruits, whole or broken, of a kind used for the extraction of other fixed vegetable oils (including flours and meals of oil-seeds or oleaginous fruit, n.e.s.)	0.73	0.37
245	Fuel wood (excluding wood waste) and wood charcoal	0.14	0.26
246	Wood in chips or particles and wood waste	0.21	0.18

VIIT-HQ	ROMANIA		
Code	Text	SIM	MIN_MAX
48	Cereal preparations and preparations of flour or starch of fruits or vegetables	1.26	0.23
54	Vegetables, fresh, chilled, frozen or simply preserved (including dried leguminous vegetables); roots, tubers and other edible vegetable products, n.e.s., fresh or dried	2.80	0.45
56	Vegetables, roots and tubers, prepared or preserved, n.e.s.	4.73	0.14
61	Sugars, molasses and honey	3.08	0.80
62	Sugar confectionery	1.76	0.21
98	Edible products and preparations, n.e.s.	1.93	0.17
122	Tobacco, manufactured (whether or not containing tobacco substitutes)	2.59	0.21
212	Fur skins, raw (including heads, tails, paws and other pieces or cuttings, suitable for furriers' use), other than hides and skins of group 211	6.54	0.18
247	Wood in the rough, whether or not stripped of bark or sapwood, or roughly squared	1.41	0.23

Source:Our calculations using the Comtradedatabase

Table 5(b): Main horizontally and vertically differentiated products traded between Bulgaria and the EU (3-digit level)

HIIT	BULGARIA		
Code	Text	SIM	MIN_MAX
335	Residual petroleum products, n.e.s., and related materials	1.11	0.25
431	Animal or vegetable fats and oils, processed; waxes; inedible mixtures or preparations of animal or vegetable fats or oils, n.e.s.	1.09	0.21
524	Other inorganic chemicals; organic and inorganic compounds of precious metals	0.85	0.67
531	Synthetic organic colouring matter and colour lakes, and preparations based thereon	1.03	0.19
575	Other plastics, in primary forms	0.79	0.14
612	Manufactures of leather or of composition leather, n.e.s.; saddlery and harness	0.86	0.45
621	Materials of rubber (e.g., pastes, plates, sheets, rods, thread, tubes, of rubber)	0.76	0.92
642	Paper and paperboard, cut to size or shape, and articles of paper or paperboard	1.10	0.29
653	Fabrics, woven, of man-made textile materials (not including narrow or special fabrics)	1.08	0.17
673	Flat-rolled products of iron or non-alloy steel, not clad, plated or coated	0.81	0.15

VIIT-LQ	BULGARIA		
Code	**Text**	**SIM**	**MIN_MAX**
25	Eggs, birds', and egg yolks, fresh, dried or otherwise preserved, sweetened or not; egg albumin	0.59	0.25
44	Maize (not including sweet corn), unmilled	0.49	0.61
45	Cereals, unmilled (other than wheat, rice, barley and maize)	0.17	0.57
47	Other cereal meals and flours	0.56	0.45
59	Fruit juices (including grape must) and vegetable juices, unfermented and not containing added spirit, whether or not containing added sugar or other sweetening matter	0.41	0.21
75	Spices	0.36	0.86
81	Feeding stuff for animals (not including unmilled cereals)	0.69	0.84
98	Edible products and preparations, n.e.s.	0.61	0.14
111	Non-alcoholic beverages, n.e.s.	0.25	0.13
112	Alcoholic beverages	0.41	0.21
VIIT-HQ	**BULGARIA**		
Code	**Text**	**SIM**	**MIN_MAX**
62	Sugar confectionery	1.52	0.32
73	Chocolate and other food preparations containing cocoa, n.e.s.	2.01	0.24
74	Tea and maté	1.67	0.18
251	Pulp and waste paper	1.91	0.34
261	Silk	2.30	0.91
264	Jute and other textile bast fibres, n.e.s., raw or processed but not spun; tow and waste of these fibres (including yarn waste and garnetted stock)	2.07	0.92
269	Worn clothing and other worn textile articles; rags	8.41	0.94
283	Copper ores and concentrates; copper mattes; cement copper	1.56	0.76
321	Coal, whether or not pulverized, but not agglomerated	2.37	0.22
411	Animal oils and fats	1.28	0.13

Source:Our calculations using the Comtradedatabase

Table 6(a): Trade types of Romania with some EU members (%) in 2012 (3-digit level)

Country	INTER	INTRA	HIIT	VIIT
Austria	0.41	0.59	0.16	0.43
Belgium	0.49	0.51	0.19	0.41
Denmark	0.75	0.25	0.05	0.20
Finland	0.81	0.19	0.08	0.11
France	0.31	0.69	0.28	0.41
Germany	0.29	0.71	0.24	0.47
Greece	0.34	0.66	0.26	0.40
Ireland	0.65	0.35	0.00	0.35
Italy	0.24	0.76	0.24	0.52
Luxembourg	0.86	0.14	0.00	0.14
Netherlands	0.51	0.49	0.09	0.40
Portugal	0.40	0.60	0.14	0.46
Spain	0.48	0.52	0.10	0.42
Sweden	0.58	0.42	0.17	0.25
United Kingdom	0.51	0.49	0.10	0.39

Source: Our calculations using the Comtrade database

Table 6(b) : Trade types of Bulgaria with some EU (%) in 2012 (3-digit level)

Country	INTER	INTRA	HIIT	VIIT
Austria	0.47	0.53	0.20	0.33
Belgium	0.77	0.23	0.03	0.21
Denmark	0.65	0.35	0.07	0.28
Finland	0.85	0.15	0.02	0.13
France	0.48	0.52	0.09	0.43
Germany	0.47	0.53	0.11	0.42
Greece	0.26	0.74	0.32	0.42
Ireland	0.91	0.09	0.00	0.09
Italy	0.32	0.68	0.20	0.48
Luxembourg	0.71	0.29	0.00	0.29
Netherlands	0.64	0.36	0.08	0.28
Portugal	0.78	0.22	0.10	0.12
Spain	0.49	0.51	0.23	0.28
Sweden	0.54	0.46	0.08	0.38
United Kingdom	0.59	0.41	0.09	0.32

Source: Our calculations using the Comtrade database

Table 7a: Estimated trade flows between EEC-2 and EU-25 over the whole sample and two subperiods using static panel data methods

Variables	1990 - 2012			1990 - 1999			2000 - 2012		
	FEM	REM	FEVD	FEM	REM	FEVD	FEM	REM	FEVD
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	x_{ij}	x_{ij}	x_{ij}	x_{ij}	x_{ij}	x_{ij}	x_{ij}	x_{ij}	x_{ij}
$GDPT_{iit}$	0.735	1.293	0.735	1.863	1.127	1.863	0.853	1.163	0.853
	(8.30)***	(10.13)***	(11.21)***	(13.15)***	(11.09)***	(14.29)***	(10.18)***	(11.43)***	(13.41)***
$DIST_{ij}$	0.000	-1.259	-0.751	0.000	-1.297	-0.523	0.000	-1.167	-0.409
	(.)	(9.35)***	(15.13)	(.)	(6.01)***	(6.18)***	(.)	(8.32)***	(12.17)***
$DGDPT_{ijt}$	0.121	0.071	0.121	0.149	0.215	0.149	-0.072	-0.061	-0.072
	(1.79)*	(0.35)	(3.72)*	(5.69)***	(6.93)***	(7.23)***	(1.09)	(2.08)*	(0.76)
RCS_{ijt}	-1.132	-0.309	-1.132	-1.312	-1.356	-1.312	-0.514	-0.129	-0.514
	(5.61)***	(1.18)	(12.31)***	(8.18)***	(8.45)***	(10.11)***	(8.22)***	(8.26)***	(9.56)***
Acc_{ijt}	0.379	0.359	0.379	-	-	-	-	-	-
	(10.21)***	(10.22)***	(11.23)***						
Constant	-4.346	-3.623	-4.022	-5.089	-3.872	-3.643	-4.117	-3.248	-3.308
	(9.67)***	(6.51)***	(11.65)***	(7.43)***	(7.23)***	(11.23)***	(11.21)***	(8.37)***	(17.03)***
Observations	1140	1140	1140	600	600	600	540	540	540
R-squared	0.72	0.70	0.91	0.69	0.71	0.89	0.78	0.82	0.92
Fischer	31.19	-	-	18.43	-	-	82.51	-	-
Prob>F	(0.00)			(0.00)			(0.00)		
Hausman	-	748.16	-	-	127.15	-	-	382.09	-
Prob>chi2		(0.00)			(0.00)			(0.00)	
Absolute value of t statistics in parentheses									
* significant at 10%; ** significant at 5%; *** significant at 1%									

Table 7b: Estimated trade flows between EEC-2 and EU-25 over the whole sample and two subperiods using the GMM dynamic panel data method

Variable	1990-2012	1990-1999	2000-2012
	(1)	(2)	(3)
	x_{ij}	x_{ij}	x_{ij}
LX_{ij-1}	0.679	0.611	0.817
	(26.15)***	(21.28)***	(15.23)***
$GDPT_{ijt}$	0.319	0.218	0.372
	(7.07)***	(8.23)***	(6.15)***
$DIST_{ij}$	-0.325	-0.411	-0.232
	(5.20)***	(10.02)***	(3.54)***
$DGDPT_{ijt}$	0.031	0.053	-0.017
	(2.63)***	(3.19)***	(2.15)*
RCS_{ijt}	-0.082	-0.163	-0.036
	(2.69)***	(9.54)***	(6.85)***
Acc_{ijt}	0.062	0.085	-
	(10.21)***	(11.21)***	
Constant	-1.672	-0.862	-1.793
	(5.92)***	(4.45)***	(7.32)***
Observations	1140	600	540
Hansen test of overidentification	51.06	49.13	53.17
Prob > chi2	(1.23)***	(0.91)***	(1.04)***
Arellano-Bond test for AR(2)	0.67	0.63	-0.70
Prob > z	(0.51)***	(0.45)***	(0.49)***
Absolute value of t statistics in parentheses			
* significant at 10%; ** significant at 5%; *** significant at 1%			