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THE IMPACT OF ASSOCIATION AGREEMENTS ON TRADE FLOWS AND THE TRADE BALANCE: EVIDENCE FROM THE CEEC-4

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Abstract

In this paper we focus on the trade balance effects of free trade agreements between the EU-15 and the CEEC-4 countries using a dynamic panel data approach. Our theoretical framework is the gravity model, and the econometric method used to analyse the effect of the agreement variable is the system generalized method of moments (GMM). Our estimation results indicate a positive and significant impact of FTAs on trade flows. However, exports and imports are affected in different ways, leading to some disparity in trade flow performance between countries. Therefore, there is an asymmetric impact on the trade balance, the agreement variable resulting in a trade balance deficit in the CEEC-4.

Keywords: Regionalisation, Trade flows, Trade balance, Panel data methods.
JEL Classification: E61**,** F13**,** F15**,** C25.

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1. Introduction

Trade liberalisation represents one of the most important developments in the world economy in the last three decades. Many countries have liberalised their trade regime over that period of time, either unilaterally or as part of multilateral initiatives, in the pursuit of economic growth, a more efficient allocation of resources, greater competition, an increase in capital accumulation and technical progress. Trade liberalisation is expected to increase the exports and imports but its implications for the trade balance are uncertain because they depend on its relative impact on export and import growth. The existing empirical literature generally finds a positive impact on both imports and exports (Thomas et al., 1991; Winters and Soloaga (2001), Santos-Paulino, 2002a, Carrère (2006), Rault and al. (2008), Caporale et al., 2008a), although a few studies do not or find only small effects (see, e.g., Greenaway and Sapsford, 1994; Jenkins 1996, Frankel 1997). Other contributions focus on the effects of trade liberalisation on the trade balance (UNCTAD 1999, Santos-Paulino and Thirlwall, 2004; Yi Wu, Li Zeng, 2008; Caporale et al., 2008b), and find that liberalisation stimulates import more than export growth, leading to a worsening of the balance of trade and payments.

In this paper we focus on the association agreements between four Central and Eastern European countries (CEEC-4, i.e. Bulgaria, Hungary, Poland and Romania) which have recently joined the EU, and fifteen other member states (EU-15, i.e. Austria, Belgium-Luxemburg, Denmark, England, Finland, France, Germany, Greece, Holland, Ireland, Italy, Portugal, Spain, Sweden) in the context of EU enlargement towards the East. Our econometric analysis is based on the gravity model and tries to determine the effects of association agreements on trade flows and trade balance. We are particularly interested in whether the impact of European agreements on the two components of trade (exports and imports) is symmetric or asymmetric. To address these issues, we examine the links between exports and imports volume introducing a dummy variable which represents the association agreement and estimate its impact of this on exports and imports respectively and the consequences on trade balance.

The structure of this paper is as follows. Section 2 contains some background information and theory on trade liberalisation and association agreements. Section 3 outlines the econometric methodology. Section 4 provides details of the estimated model and the obtained empirical results. Section 5 offers some concluding remarks.

2. Trade liberalisation and association agreements

Regional trade liberalisation has been particularly successful in Western Europe since the 60s. In the 90s deeper economic integration was sought with a view to a future monetary union. The Common Market has been achieved in 1993 by eliminating trade, administrative and technical barriers and hence transaction costs. In January 1999, with the introduction of the euro, currency conversion costs and exchange rate volatility were also eliminated.

Externally, the EU was faced with the economic and political challenge represented by the Eastern European countries, and aimed to provide a framework to facilitate their gradual economic and political integration. After 1990, the European Council had discussed the possibility of EU enlargement to include new member countries from Central and Eastern Europe. All these countries signed association agreements with the EU, which created a free trade area (see Table1).

Table 1: Signature and entry into force of European Association Agreements

CEEC	**Signature**	**Entry into force**
Hungary	16 December 1991	1 February 1994
Poland	16 December 1991	1 February 1994
Romania	1 February 1993	1 February 1995
Czech Republic	4 October 1993	1 February 1995
Slovakia	4 October1993	1 February 1995
Bulgaria	8 March 1993	1 February 1995
Latvia	12 June 1995	1 February 1996
Estonia	12 June 1995	1 February 1996
Lithuania	12 June 1995	1 February 1996
Slovenia	end of 1995	1 June 1996

Source: European Commission report, 2000.

In 1993, the European Council meeting in Copenhagen gave the CEECs the option of joining the EU once they had fulfilled a series of economic and political conditions. As a result, in 2004 ten additional countries[1] joined the European Union in the first "wave" of the enlargement process, while Romania and Bulgaria joined in 2007, in the second wave. The European association agreements (later completed by a series of protocols) provided the legal framework for trade relationships between the candidate countries and EU. A time schedule was specified for trade liberalisation between the signatories, the EU committing itself to a faster reduction of trade barriers than the Central and Eastern European countries.

International trade theory suggests that for developing countries the benefits from trade liberalisation with industrialised countries are access to a much greater variety of productive inputs and consumer goods, and technical advances incorporated in imports of capital or intermediate and consumption goods. Gravity models represent the standard theoretical framework to analyse these effects. They were inspired by Newton's gravity law. The first applications including the contributions of Tinbergen (1962) and Pöyhönen (1963) were rather intuitive. "New trade theory" provided theoretical justifications in terms of imperfect competition, increasing returns of scale, and transport costs. The model was extended by Anderson (1979), Bergstrand (1985), Helpman and Krugman (1985). Linnemann (1966) proposed a gravity model derived from a 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. In the present case, as we focus on the impact of the European association agreements on CEEC imports and exports and their trade balance as a whole, the main explanatory variables of the model are income of two countries, the transport costs (transaction costs) and the signing of a European agreement.

[1] Hungary, Poland, Check Republic, Slovenia, Estonia, Lithuania, Latvia, Malta, Cyprus, Slovakia

3. The Econometric Methodology: The Generalized Method of Moments (GMM)

In our analysis we use the system Generalized Method of Moments (GMM) estimator developed by Arellano and Bover (1995) in order to highlight the impact of the European association agreements on trade flows in a dynamic framework. We consider the following equation:

$$y_{i,t} = \alpha y_{i,t-1} + \beta X_{i,t} + u_i + \nu_t + e_{i,t} \qquad (1)$$

where X_{it} represents the explanatory variables of the model, $\boldsymbol{u_i}$ is the individual specific effect, $\boldsymbol{v_t}$ is the time specific effect, and $\boldsymbol{e_{it}}$ is the error term (***i*** is individual index, and ***t*** is the time index).

The presence of the lagged dependent variable as an explanatory variable does not allow the use of standard econometric techniques. The GMM method for dynamic panels provides solutions to the problems of simultaneity bias, reverse causality and omitted variables. Besides, it allows one to control for individual specific effects $\boldsymbol{u_i}$, and time effects v_t, as well as to overcome the endogeneity bias.

There are two types of GMM estimators for dynamic panels:

- The first-differenced GMM estimator (Arellano and Bond, 1991);
- The system GMM estimator (Blundell and Bond, 1998).

The former eliminates specific individual effects through first-differencing of a single equation, and then instruments the explanatory variables using their lagged values in levels. The latter involves the estimation of a system containing both first–differenced and levels equations, where the variables are instrumented by their first differences.

The choice of lagged variables as instruments depends on the nature of the explanatory variables:

1. For the exogenous variables, their current values are used as instruments;

2. For variables which are either predetermined or influenced by previous values of the dependent variable, but not correlated with future values of the error term, lagged values for at least one period can be used as instruments;
3. For endogenous variables, only their lagged values for at least two periods can be used as valid instruments.

The use of these estimators is based on the assumption of quasi-stationary variables in the equation in levels, and no autocorrelation of the residuals. To deal with potential omitted variables bias arising from specific effects, the strategy of Arellano-Bond estimator (1991) is to take first differences. This implies the following specification:

$$y_{i,t} - y_{i,t-1} = \alpha(y_{i,t-1} - y_{i,t-2}) + \beta(X_{i,t} - X_{i,t-1}) + (\nu_t - \nu_{t-1}) + (e_{i,t} - e_{i,t-1}) \quad (2)$$

By construction, the error term ($e_{i,t} - e_{i,t-1}$) is correlated with the lagged variable in differences ($y_{i,t-1} - y_{,t-2}$). The first differences of the explanatory variables of the model are instrumented through their lagged values (in levels) in order to reduce the simultaneity bias and the bias resulting from the presence of the lagged dependent variable in differences on the left-hand side.

Under the assumption that the error terms are not autocorrelated and that the explanatory variables of the model may be influenced by lagged values, but are uncorrelated with future values of the error term**,** the following moment conditions have to be satisfied for the equation in first differences:

$$E|(y_{i,\,t-s}\,,\,(e_{i,t} - e_{i,t-1})| = 0 \text{ for } s \geq 2\ ;\ t = 3,\ldots,T \quad (3)$$

$$E|(X_{i,\,t-s}\,,\,(e_{i,t} - e_{i,t-1})| = 0 \text{ for } s \geq 2\ ;\ t = 3,\ldots,T \quad (4)$$

However, this estimator suffers from the "weakness" of its instruments, which entails considerable bias, especially for small size samples, and therefore its accuracy is asymptotically low. Specifically, the lagged values of the explanatory variables are "weak" instruments for the equation in first differences: the GMM estimator for the first

difference takes into account only the intra- individuals variations, the inter-individuals variations being removed through the differencing.

The GMM system estimator eliminates this problem by combining the equation in difference with an equation in levels, i.e. it estimates equation (2) (in first differences) simultaneously with equation (1) (in levels). In equation (1), the variables are instrumented using their most recent lags in first differences. Blundell and Bond (1998) tested this method using Monte Carlo simulations and found that:

- the GMM system estimator is more efficient than the GMM in differences;
- the GMM in first differences produces biased coefficients for small samples when the instruments are "weak".

For the equation in levels, the GMM system method uses additional moment conditions assuming that the explanatory variables are stationary:

$$E|(y_{i,\,t-s} - y_{i,t-s-1}) \,.\, (u_i + e_{i,t})| = 0 \text{ for } s = 1 \qquad (5)$$

$$E|(X_{i,\,t-s} - X_{i,t-s-1}) \,.\, (u_i + e_{i,t})| = 0 \text{ for } s = 1 \qquad (6)$$

Conditions 3 to 6 combined with the GMM method allow one to estimate the coefficients of model.

To test the validity of the lagged variables as instruments, Arellano and Bond (1991) and Arellano and Bover (1998) suggest the Sargan/Hansen test of over-identification. By construction the error term in first differences is autocorrelated of order one, but it should not be autocorrelated of order two. To test this hypothesis, Arellano and Bond (1991) recommend using an (AR2) autocorrelation test, where the null hypothesis is the absence of second-order autocorrelation in the residuals of the equation in differences.

4. Econometric analysis

The gravity equation we estimate in order to investigate the impact of the association agreements on exports and imports of the CEEC-4 to/from EU-15 and their consequences on the trade balance is the following :

$$Log(X_{ijt}) = a_0 + a_1 \log(X_{ijt-1}) + a_2 \log(GDP_{it}) + a_3 \log(GDP_{jt}) + a_4 \log(DGDPT_{ijt}) + a_5 \log(Dist_{ij}) + a_6 \log(TCR_{ijt}) + a_7 Acc_{ijt} + \varepsilon_{ijt} \quad (7)$$

and

$$Log(M_{ijt}) = a_0 + a_1 \log(M_{ijt-1}) + a_2 \log(GDP_{it}) + a_3 \log(GDP_{jt}) + a_4 \log(DGDPT_{ijt}) + a_5 \log(Dist_{ij}) + a_6 \log(TCR_{ijt}) + a_7 Acc_{ijt} + \varepsilon_{ijt} \quad (8)$$

and

$$Log(TB_{ijt}) = a_0 + a_1 \log(TB_{ijt-1}) + a_2 \log(GDP_{it}) + a_3 \log(GDP_{jt}) + a_4 \log(DGDPT_{ijt}) + a_5 \log(Dist_{ij}) + a_6 \log(TCR_{ijt}) + a_7 Acc_{ijt} + \varepsilon_{ijt}$$

where: X_{ijt} and M_{ijt} denote exports and imports respectively between countries ***i*** and ***j*** at time ***t*** with $i \neq j$ (millions of dollars), TB_{ijt} stands for the trade balance as a proportion of GDP, and the other variables are defined in Table 2.

Table 2: Variable definitions and their expected signs

Variables	**Explanation of variables**	**Expected signs**
α_o	intercept	
GDP_{it}, GDP_{jt}	Gross Domestic Product of country ***i*** and country ***j*** (millions of dollars**)**	+
$DGDPC_{ijt}$	difference in GDP per capita between partners - a proxy for economic distance and comparative advantage intensity	+/-
$Dist_{ij}$	distance between country *i* and country *j* (kilometers)	-
TCR_{ijt}	real exchange rate (price competitiveness)	+/-

Acc_{ijt}	dummy variable that is equal to 1 if country *i* and country *j* have signed a regional agreement, and zero otherwise	+
ε_{ijt}	the disturbance term, which is assumed to be normally distributed with a zero mean and a constant variance for all observations and to be uncorrelated.	

The source of data is the CHELEM – CEPII data base for GDP, GDP/capita, nominal exchange rate and population; the CEPII data base for geographic distance; and the World Bank – World Tables for the consumer index price. The estimation period goes from 1987 to 2006, i.e. 20 years for a sample including the EU-15 and the CEEC-4.

4.1 Estimation results

This section summarises the results from the estimation of the gravity model. We used dynamic panel data techniques (GMM) in order to highlight the impact of the association agreements on trade flows and trade balance in a dynamic framework (see Table 3 and 4).

INSERT TABLE 3 AND 4 ABOUT HERE

To establish whether the effect on the trade balance is symmetric or asymmetric, we estimate separately the effects on exports (Table 3) and imports (Table 4). The association agreements appear to have had a positive impact on both CEEC-4 exports and imports towards the EU-15, but the coefficients are higher for imports (0.39) than for exports (0.27), indicating asymmetry. This is a standard result consistent with the theory of regional integration: membership of the trade agreements facilitates trade exchanges between the partners. All the estimated coefficients are statistically significant and have the expected signs consistent with the gravity model: we find a positive effect on trade flows of country size and association agreements, and a negative impact of geographical distance. Also, devaluations of the currency increase exports and therefore improve the trade balance.

Concerning the latter, we note that the association agreements have led to an increasing trade deficit for the CEEC-4 with respect to the EU-15 (see Chart 1). The GMM estimates also indicate a negative impact of the association agreements on the trade balance (see Table 5). Some potential explanations are: (i) the lack of product competitiveness in the European market, (ii) increasing vertical FDI, these countries importing intermediate goods necessary for their production process; (iii) a greater preference of consumers for products from the EU.

From an econometric point of view, the GMM estimates appear to be consistent, there is no residual autocorrelation, and the validity of the instruments is confirmed by Sargan's test. The coefficients are all statistically significant and with the expected signs. Overall, the coefficient of the agreement variable indicates a positive and significant impact on trade flows but an asymmetric effect on exports and imports, leading to a trade balance deficit in the CEEC-4.

5. Conclusions

This paper has analysed the impact of the European association agreements on exports and imports and the trade balance of the CEEC-4 using a dynamic panel data approach (GMM). Consistently with theory, association agreements were found to have a positive and significant impact on exports and imports of the CEEC-4 towards/from the EU-15. However, the estimated coefficients are higher for imports (0.39) than for exports (0.27), which suggests trade asymmetry. In particular, the agreements resulted in increasing trade deficits for the CEEC-4 countries (net importers), which is not desirable for economies still trying to catch up with the other EU states[2]. Nevertheless, these countries benefited from the higher trade flows by gaining access to a much greater variety of productive inputs and consumer goods, as well as technical advances incorporated in imports of capital or intermediate and consumption goods.

[2] The trade balance is a component of GDP: a surplus increases GDP and a deficit reduces it.

Convergent or divergent dynamics of imports and exports are the main cause of changes in the trade balance. The evolution of exports, imports as well as of the trade balance over the estimation period for all CEEC-4 highlights the persistence and the deepening of the trade deficit in all CEEC-4 (see Charts 1 and 2). The lower growth in exports can be interpreted in terms of low EU demand for CEEC products reflecting their lack of attractiveness for European consumers, despite their price competitiveness based on comparative advantages reflecting lower labour costs. Trade liberalisation did not lead to a restructuring of exports and to a development of the most innovative sectors of the economy. Instead, CEEC-4 exports are still represented mainly by labour-intensive products with lower added value[3].

Higher trade openness and the progressive liberalisation of capital flows resulting from the trade agreements have strongly influenced the behaviour of multinationals firms. Vertical FDI in the CEEC-4 countries has increased. This type of investment consists in the fragmentation of the production process to take advantage of countries with lower costs. The production location which results from it inevitably entails a rise of intermediate and equipments good imports of these countries from the investor's countries. Thus, in the case of the CEEC-4 countries vertical FDI has induced a significant increase of intermediate and equipments good (and hence of total imports): these now represent more than half of the CEEC-4 countries total imports from the EU (see Chart 3). In order to reduce their trade deficit and to have a sustainable trade balance, the CEEC-4 countries would need instead more intra-industry trade with high added-value products so as to increase their export competitiveness towards the EU and to attract horizontal FDI, thereby achieving real convergence.

[3] See Rault et al. (2008)

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Table 3 - The impact of the association agreements on exports

VARIABLES	GMM
	(1)
	X_{ijt}
$\mathbf{X_{ijt-1}}$	0.992
	(57.76) ***
$\mathbf{PIB_{it}}$	0.944
	(79.09)***
$\mathbf{PIB_{jt}}$	1.068
	(140.04)***
$\mathbf{Dist_{ij}}$	-1.341
	(78.93)***
$\mathbf{DPIBT_{ijt}}$	0.119
	(6.05)***
$\mathbf{TCR_{ijt}}$	-0.032
	(25.02)***
$\mathbf{Acc_{ijt}}$	0.27
	(11.12)***
Constant	4.936
	(37.27)***
Observations	1064
Number of groups	56
Sargan test of overid. restrictions: chi2	229.66
Prob > chi2	(0.983)
Arellano-Bond test for AR(1) in first differences: z	-1.21
Prob>z	(0.228)
Arellano-Bond test for AR(2) in first differences: z	-0.98
Prob>z	(0.328)
Robust t statistics in parentheses	
* significant at 10%; ** significant at 5%; *** significant at 1%	

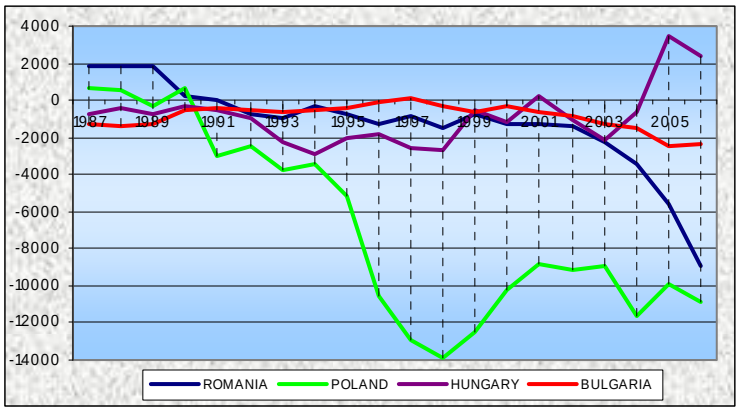
Table 4 – The impact of the association agreements on imports

VARIABLES	GMM
	(1)
	M_{ijt}
$\mathbf{M_{ijt\ -1}}$	0.909
	(48.14)***
$\mathbf{PIB_{it}}$	0.998
	(15.39)***
$\mathbf{PIB_{jt}}$	0.774
	(7.32)***
$\mathbf{Dist_{ij}}$	-1.452
	(10.11)***
$\mathbf{DPIBT_{ijt}}$	0.447
	(2.56)**
$\mathbf{TCR_{ijt}}$	0.027
	(2.51)**
$\mathbf{Acc_{ijt}}$	0.390
	(53.55)***
Constant	-4.646
	(4.11)***
Observations	1064
Number of groups	56
Sargan test of overid. restrictions: chi2	223.61
Prob > chi2	(0.994)
Arellano-Bond test for AR(1) in first differences: z	-1.10
Prob>z	(0.272)
Arellano-Bond test for AR(2) in first differences: z	-1.01
Prob>z	(0.313)
Robust t statistics in parentheses	
* significant at 10%; ** significant at 5%; *** significant at 1%	

Table 5 – The impact of the association agreements on the trade balance

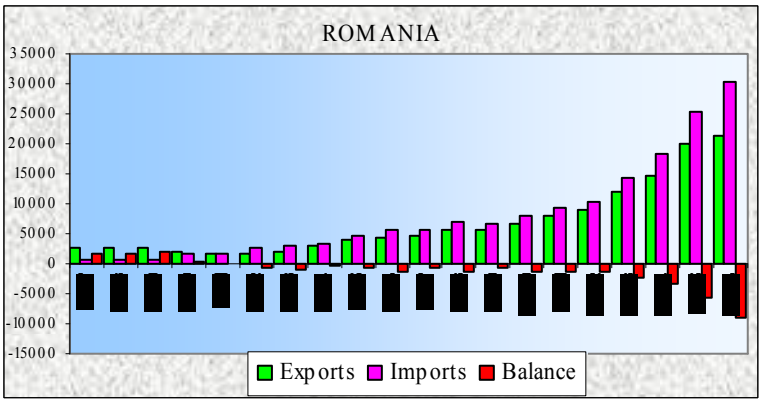
VARIABLES	GMM
	(1)
	TB_{ijt}
TB_{ijt-1}	0.589
	(14.42)***
PIB_{it}	-0.056
	(1.66)
PIB_{jt}	0.274
	(6.58)***
$Dist_{ij}$	-0.433
	(5.30)***
$DPIBT_{ijt}$	0.174
	(2.94)**
TCR_{ijt}	-0.016
	(3.09)**
Acc_{ijt}	-0.186
	(5.83)***
Constant	-1.187
	(2.04)***
Observations	1064
Number of groups	56
Sargan test of overid. restrictions: chi2	365.80
Prob > chi2	(0.752)
Arellano-Bond test for AR(1) in first differences: z	-12.84
Prob>z	(0.000)
Arellano-Bond test for AR(2) in first differences: z	0.66
Prob>z	(0.508)
Robust t statistics in parentheses	
* significant at 10%; ** significant at 5%; *** significant at 1%	

Chart 1. Evolution of the trade balance of the CEEC-4 with the EU -15.



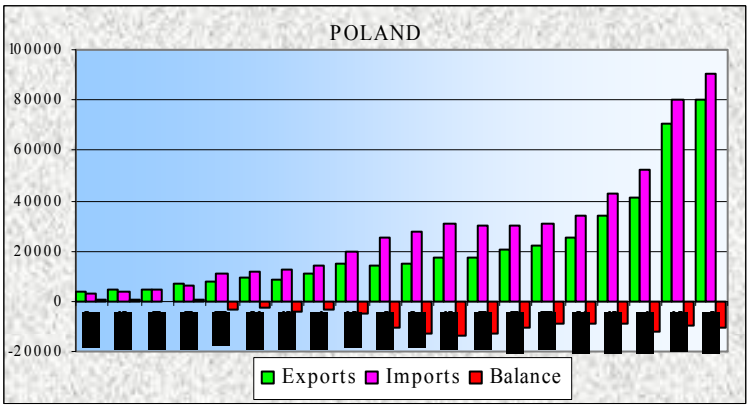
Data source : CHELEM – French CEPII data base. Calculations by the authors.

Chart 2.a - Evolution of exports, imports and trade balance of Romania with EU-15



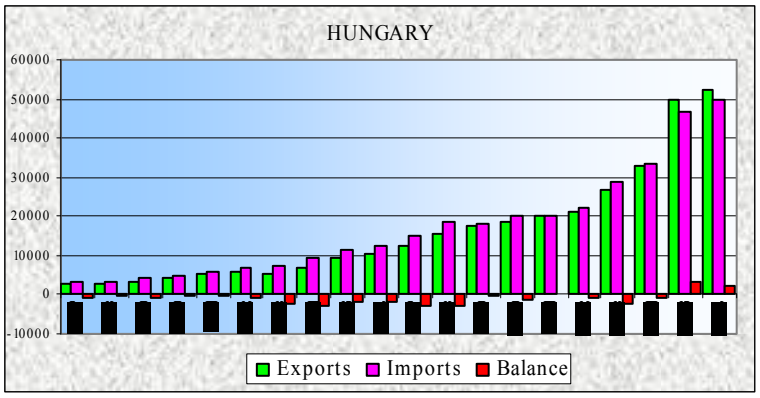
Data source : CHELEM – French CEPII data base. Calculations by the authors.

Chart 2.b. Evolution of exports, imports and trade balance of Poland with EU-15



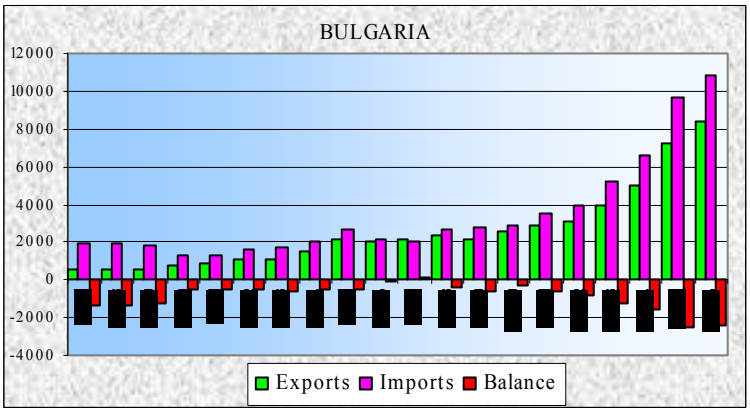
Data source : CHELEM – French CEPII data base. Calculations by the authors.

Chart 2.c. Evolution of exports, imports and trade balance of Hungary with EU-15



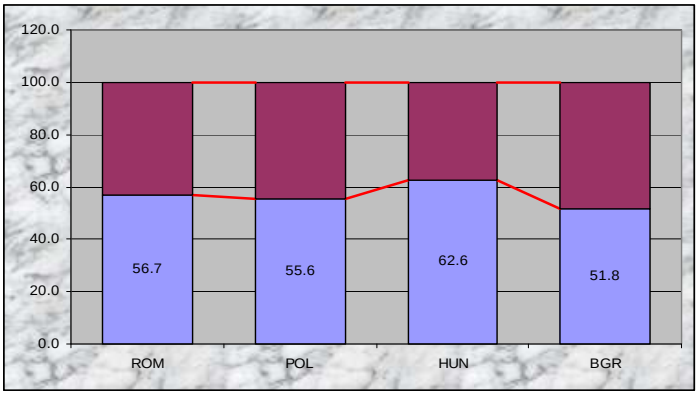
Data source : CHELEM – French CEPII data base. Calculations by the authors.

Chart 2.d. Evolution of exports, imports and trade balance of Bulgaria with EU-15



Data source : CHELEM – French CEPII data base. Calculations by the authors.

Chart 3 – Imports of intermediate goods and equipment as a % of total imports, 2004



Data source: CHELEM – French CEPII data base. Calculations by the authors.