Hub-and-Spoke or else? Free trade agreements in the 'enlarged' European Union

Luca De Benedictis[a], Roberta De Santis[b] and Claudio Vicarelli[b, 1]

[a]University of Macerata - [b]Institute for Studies and Economic Analyses, Rome

Abstract

The object of this paper is to estimate if and how the Central European Free Trade Agreement (CEFTA) and the Baltic Free Trade Agreement (BFTA) exerted a significant impact on intra-European trade, effectively reducing the influence of the European Association Agreements (EAs) in shaping the European trade structure has a hub-and-spoke system – with the EU15 being the hub and the CEECs the spoke. This paper analyses bilateral trade flows between eight CEECs and EU15 and between the CEECs themselves. We estimate a gravity equation using a system GMM dynamic panel data approach. Results support the assumptions that gravity forces and "persistence effects" matter. With respect to the effect of free trade agreements, evidence is found that Free trade agreements between CEECs matter: There is evidence that the presence of intra-periphery agreements helped expand intra-periphery trade and limited the emergence of a "hub-and-spoke" relationship between CEECs and EU. This results have important policy implications for the trade strategy of "future" EU members of the Southeastern European Countries as well as of the Southern Mediterranean Countries. According to the empirical results, these countries should move towards a regional free-trade area as exemplified by the CEFTA and the BFTA to avoid "hub-and-spoke" effects.

JEL Classification: F13, F15; C13, C23

Keywords: trade flows, regional integration, EU eastward enlargement, gravity model, dynamic panel data

> [...] *what I want to achieve is not a 'hub and spoke' network of bilateral agreements between the EU and its partners, but a truly integrated regional approach* [...]
>
> Peter Mandelson, EU Trade Commissioner[2]

1. Introduction

While the economic analysis of Free Trade Agreements (FTAs) has reached the status of a well established research area in theoretical and empirical international trade, "... far less is known about the more complex economics when FTAs overlap in a hub-

---

[2]. The quote is from a speech by EU Trade Commissioner, Peter Mandelson, on EU trade policy and the stability of the Middle-East, Hebrew University, Jerusalem, 19 May 2005. The specific topic discussed by Mandelson was the liberalization of services and investments in manufacturing.

and-spoke system" (Kowalczyk and Wonnacott, 1992). This may be the deep-rooted reason inducing Peter Mandelson to prefer for the EU and its regional partners a 'truly integrated regional approach' to a 'hub-and-spoke network of bilateral agreements'. In spite of that, the goal of this paper is not to find out if FTAs that take the hub-and-spoke form have to be preferred or not with respect to other possible forms that FTAs could take. This paper examines the issue from an empirical perspective, focusing on the effects of FTAs in Europe in terms of boosting trade flows between the core Europe (EU15) and the CEECs3 and among the CEECs themselves. In particular, we look for empirical evidence showing whether and how the Central European Free Trade Agreement (CEFTA) and the Baltic Free Trade Agreement (BFTA) exerted a significant impact on intra-European trade, effectively reducing the influence of the European Association (EA) in shaping the European trade structure has a hub-and-spoke system – with the EU15 being the hub and the CEECs the spokes.[4]

We quantify these effects using a panel of bilateral export flows starting from 1994. The choice of the starting year is not casual. Although the formal beginning of negotiations for eastward EU enlargement is fairly recent, the CEECs accession process somehow began shortly after the free market system got under way. In fact, since the early 1990s, the acceding countries have been signing bilateral agreements with the EU – i.e. the EA agreements – which have represented an advance on the path towards integration, through a progressive liberalisation of intra-European trade. On the other hand, in 1992 Czech and Slovak Republic, Hungary and Poland gave origin to the CEFTA, and in 1996 Slovenia joined CEFTA as a full member. In 1994 the BFTA also entered into force. Since then, the CEECs signed several bilateral trade agreements among themselves. Our research question is about the effectiveness of those agreements in shaping the intra-EU trade system.

The paper is organised as follows. The first section defines a hub-and-spoke trade system and indicates how it is relevant in terms of trade volumes and welfare. Section 2 gives a brief description of the evolution of FTAs in Europe since the beginning of the 1990s. Section 3 shows how the changes in trade integration in Europe have been empirically studied under a gravity setup. Section 4 describes the estimated gravity equation, the empirical strategy and the data. Results are presented in section 5, and section 6 concludes.

2. Free Trade Agreements and the emergence of Hubs and spokes.

The literature on FTAs is still very much centred on the theoretical implications of the Vinerian concepts of trade creation and trade diversion, and on the empirical

---

[3]. We will use the acronym CEECs to refer to the eight Central and Eastern European countries which joined the EU in May 2004: Hungary, Poland, Czech and Slovak Republic, Slovenia, Lithuania, Latvia and Estonia.

[4]. In spite of the statement by Peter Mandelson, the EU trade policy can in general be conceived as producing a hub-and-spoke trade system. The EU is greatly involved in bilateral and multi-bilateral preferential pacts. In addition to the existing FTAs with South Africa and Mexico, the EU is negotiating one with Chile and the four MERCOSUR countries (Argentina, Brazil, Paraguay and Uruguay), and it has ratified a new bilateral agreement with 71 poor African, Caribbean and Pacific (ACP) countries: the Cotonou agreement. Taking into account the some 100 other poor countries covered by the Generalised System of Preferences, the EU's web of preferential pacts covers most of the world. In fact, there are only six countries – Australia, Canada, Japan, New Zealand, Taiwan and the United States - with which the EU trades on a most-favoured nation basis. Only States which are internationally isolated, such as Iraq and North Korea, get worse trade terms.

measurement of the same (Pomfret, 2003; Greenaway and Milner, 2003). How do FTAs evolve? Which particular structure do they take? How does the latter impacts on trade flows among member States? All these questions have received very little attention until recently. Very few contributions exist that directly address the issue of the effect of FTAs when they take the form of a hub-and-spoke structure.[5]

The earliest contribution on the topic is a paper by Kowalczyk and Wonnacott (1992) in which the authors study the effect of a hub-and-spoke trade system on trade volumes, trade costs and rent-seeking activities in the context of NAFTA. They show how spokes (Canada and Mexico) will gain or lose from a FTA with the hub (the US) according to the degree of complementarity between each bilateral spoke agreement. For example, if a hub-and-spoke trade system emerges with the US as a hub, "... a spoke like Canada can expect to benefit from its own bilateral spoke agreement with the United States. However, as the United States then goes on to add new spokes, each substitute agreement will hurt the existing spoke (Canada) while each complementary agreement will provide further benefit to the existing spoke (Canada)." (Kowalczyk and Wonnacott, 1992, p.17)

In a very different context, Puga and Venables (1998) show how the hub-and-spoke structure of a FTA can influence the incentives for firms to locate in a country or another. More recently, Deltas, Desmet and Facchini (2005) have analysed instead the effects of a hub-and-spoke trade system from both a trade volume and a welfare perspective. They compare global free trade, bilateral FTA and a hub-and-spoke system, showing that moving from a hub-and-spoke system to global free trade increases the welfare gains for spokes.

While many papers have dealt with trade liberalization strategies in Eastern European countries, as far as we know, no one has done it – neither theoretically, nor empirically – from a hub-and-spoke perspective. The reason could be nested in the lack of clear cut evidence on how the changes occurring in intra-European trade have shaped the intra-European trade system in the last decade. It is of course reasonable to assume that, the EU15 being a large and rich market, it would naturally attract, as a gravitational pole, the flows of goods and services originated by the opening up of the Eastern European economies. A hub-and-spoke trade structure would therefore naturally emerge. Other forces are however at play. The rise in income per capita levels increases CEECs imports, and those imports could be variously composed by goods and services produced in EU15 countries and in CEECs. The composition of these trade flows is necessarily conditional on the geographical location of countries and on the trade facilitating practices adopted by the same countries. Distance from international markets therefore plays a role, in absolute and relative terms, determining the remoteness of each country. And preferential agreements as well play a role, if they change the incentives for firms and consumers to sell and buy internationally. The network of trade flows that could emerge can take very different forms according to the intensity of each force at play.

---

[5]. See Bhagwati (2002) for a recent description of the multiple forms that FTAs have taken in the recent years. The trade regime that emerges from the exponential increase of FTAs in the last twenty years is defined by Bhagwati a 'spaghetti bowl'.

Figure 1: An European hub-and-spoke trade system?
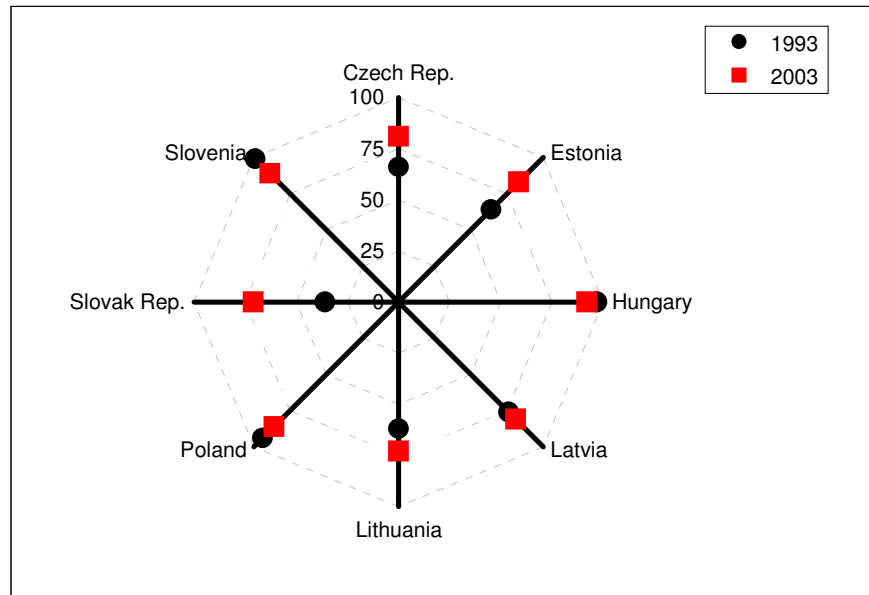
Source: our calculation on IMF DOTS

To move from conjectures to data, in figure 1 we draw a picture of the network of intra-EU trade flows in 1993 and in 2003, visualizing for every CEEC the percentage of intra-EU exports going to the EU15. As an example, the black bullet along the spoke pointing north-east indicates that in 1993 Estonia exported 63 percent of its exports directed towards the European countries6 to members of the EU15, while the remaining 37 percent reaches the other CEECs markets. The light square indicates that in 2003 the proportion did change to an 83 percent towards the EU15 and 17 percent towards the other CEECs.

The information that figure 1 conveys is that the EU15 is indeed a gravitational pole for CEECs trade flows, but the evidence of a hub-and-spoke system is less straightforward than it may appear. From 1993 to 2003 many countries reduced their share of intra-European exports directed towards the EU (Hungary, Poland and Slovenia), while others increased it (the Baltic republics and the Czech and Slovak republics). In dynamic terms, the EU15 trade structure is evolving, but the direction need not be a hub-and-spoke system.

3. A bird's eye view of FTAs in the enlarged European Union

During the last decade many trade agreements were put forward in order to encourage intra-European trade flows. During the 1990s the EU concluded European Association (EAs) agreements with all CEECs. Those agreements did imply an asymmetric tariff reduction between the EU and the CEECs. Since 1997, the EU has eliminated practically all tariffs (the exceptions are agricultural and 'sensitive' products) on imports from the CEECs. Having joined the EU in 2004, the CEECs entered into

---

6. In figure 1 we only consider intra-European trade flows. A more complete picture of CEECs international trade flows can be found in Appendix Table A.3 in the.

the EU customs union (Common External Tariff and Common Commercial Policy) and participated in the Single Market of the EU. Border controls have been abolished.

Although trade components of EAs with some CEECs went into effect on different dates ranging from 1992 (former Czechoslovakia, Hungary and Poland) to 1996 (Slovenia), schedules of elimination of duties and non tariffs barriers on industrial products had one important component in common. They all had January 1, 2002 as the date to complete the process of liberalization.

Table 1: Free Trade Agreements

	Date of entry into force			
	EU GSP	CEFTA	BFTA	EA
Czech Rep.	1991	1-Mar-93		1-Mar-92
Estonia	1992		1-Apr-94	1-Jan-95
Hungary	1990	1-Mar-93		1-Mar-92
Latvia	1992		1-Apr-94	1-Jan-95
Lithuania	1992		1-Apr-94	1-Jan-95
Poland	1990	1-Mar-93		1-Mar-92
Slovak Rep.	1991	1-Mar-93		1-Mar-92
Slovenia	1980*	1-Jan-96		1-Jan-97

*Source: http://www.wto.org/english/thewto_e/whatis_e/tif_e/agrm1_e.htm *Slovenia retained preferential status for its exports under the so-called autonomous trade preferences granted by the EU to Yugoslavia in the 1980 Cooperation Agreement.*

Several CEECs have also signed free trade agreements among themselves (Tables 1 and 2). The first preferential agreement among CEECs was CEFTA, which entered into force in 1993. Its membership gradually expanded over time. The CEFTA provides a framework for bilateral agreements among seven states. More precisely, the CEFTA system has two components: multilateral and bilateral. A multilateral component comprises commonly agreed preferences, whereas a bilateral one includes those negotiated bilaterally and not extended to all CEFTA members.

The original CEFTA agreement eliminates duties on approximately 40% of industrial goods. Through a series of additional protocols, mostly signed in 1994 and 1995, trade in industrial goods and some agricultural products was further liberalised. By 1997, CEFTA had abolished duties on all industrial goods, apart from a minor list of "sensitive" products.

Table 2: Intra-Periphery Free Trade bilateral Agreements

	Date of entry into force					
	Estonia	Hungary	Latvia	Lithuania	Poland	Slovak Rep.
Czech Rep.	12-Feb-98		1-Jul-97	1-Jul-97		1-Jan-93
Estonia		1-Mar-01				
Hungary			1-Jan-00	1-Mar-00		
Latvia						
Lithuania						
Poland			1-Jun-99	1-Jan-97		
Slovak Rep.	12-Feb-98		1-Jul-97	1-Jul-97		
Slovenia	1-Jul-97		1-Aug-96	1-Mar-97		

Source: http://www.wto.org/english/thewto_e/whatis_e/tif_e/agrm1_e.htm

The Baltic states signed a FTA among themselves in 1995 (BFTA). The BFTA did not increase its membership, but the coverage of the agreement was expanded over time. The Baltic States by January 1997 included agricultural and fish products. Indeed the BFTA was the first free-trade area that provided for completely liberalised trade in these politically difficult areas.

The features found in the trading pattern of CEECs in the last decade (see Appendix Tables A.2 and A.3) suggest that the share of exports to EU-15 was, in the first half of the 1990s, relatively high, partly because the reduction in trade barriers has already taken place.

After 1989, in fact, the EU granted GSP (Generalised System of Preference) status first to Hungary and Poland (1990), then to Bulgaria and former Czechoslovakia (1991), and subsequently to Estonia, Latvia and Lithuania (1992). Slovenia retained preferential status for its exports under the so-called autonomous trade preferences granted by the EU to Yugoslavia in the 1980 Cooperation Agreement (Table 1). The GSP status significantly improved access of exporters from CEECs to EU markets, especially, for industrial products.[7]

Following the demise of central planning and the associated collapse of the CMEA, trade linkages among CEECs contracted dramatically and still remain very weak. The share of this trade increased between 1989 and 1993 but mainly because of the dissolution of Czechoslovakia.

It is a very difficult task to identify with any precision the extent to which preferential access to EU markets was responsible for reorientation in geographic patterns of trade of CEEC. Under central planning regime the former CMEA under-traded with the EU and overtraded with each other and other members of the bloc.[8] A sizable portion of the adjustment can be attributed to the correction of earlier trends.[9]

4. Gravity in Eastern Europe

During the last ten years gravity models were broadly used in empirical studies of integration processes in order to explore the main changes in geographic trade pattern and to analyse the effects of regional FTAs and currency unions (CU) on trade flows.

After the 1991, special attention has been given to estimate potential trade flows between EFTA, EU, CEECs and Baltic countries. 10

Most of this literature finds out that FTAs (i.e., European Agreements), that have been put in place to prepare transition countries for accession to EU, have

---

[7]. GSP preferential rates embraced 63 percent of all CN tariff lines in EU imports with most of them (94 percent of GSP items) subject to zero rates. The interim trade component of EA overshadowed GSP arrangements by retaining preferential tariffs and making them permanent rather than subject to annual reviews (Kaminsky, 2001).

[8]. Council for Mutual Economic Assistance, (CMEA), the international organization active between 1956 and 1991 for the coordination of economic policy among certain nations then under Communist domination, including Albania (after 1961), Bulgaria, Cuba, Czechoslovakia, East Germany, Hungary, Mongolia, Poland, Romania, and the Soviet Union. Yugoslavia participated in matters of mutual interest. Although it was formed in 1949, a formal charter was not ratified until 1959. See on this subject: Sobel (1990) and Kendall Metcalf (1997).

[9]. The shift from a supply-constrained economic regime to a demand-constrained regime, combined with the collapse of import demand in CMEA, could have been the major force behind the expansion of CEECs-EU trade.

[10]. For a survey see Brenton and Manzocchi (2002)

promoted substantial growth in EU-CEECs trade flows (i.e. regional dummies have positive and significant coefficients). Therefore most adjustment on trade flows has already occurred and the expected further effects of the completion of EU enlargement will be modest.

In the empirical literature on theEastern enlargement of the EU, however, the study of geographic restructuring of the trade flows, due to FTAs, among the former and the new members, received minor attention. In particular, the literature on this subject from a hub-and-spoke perspective is very poor.

Laaser and Schrader (2002)'s gravity model estimates suggest in the specific case of Estonia, Latvia and Lithuania that regional integration is much more intense than it is normally observed. According to the authors the role of distance (transport cost saving) for the Baltic countries is much more important in shaping their regional trade pattern than the institutional integration into the EU via the EAs. Laaser and Schrader estimates show that the process of EU association did not crowd out the intra regional trade, despite the expectation that the trade agreements with EU would have fostered Baltic-EU trade flows. Hence they conclude that the process of European integration runs mainly via Baltic countries' neighbours and that the transport system dominates the trade regime by shaping trade flows in this region (the coefficient of distance is close to one in all the estimates).

Damijan and Masten (2002) explore the time-dependent efficiency of free trade agreements (FTAs) in a panel framework using static and dynamic model specifications. They show that trade liberalisation per se needs time to become efficient. Using an illustrative case of rapid expansion of Slovenian imports from other CEECs, being part of CEFTA in the period 1993-98, the paper demonstrates that tariff reductions become effective in the second to third year after enforcement of the FTA. Regarding the effect of CEFTA agreement the analysis revealed that being part of CEFTA increased the exports of other CEECs towards Slovenia by 18.5%.

Paas (2003) find that the behaviour of bilateral trade flows within the countries involved in EU eastward enlargement accords with the normal rules of gravitation. He also finds that there are statistically significant spatial biases caused by the trade relationship between the Baltic Sea Region countries, the border countries and the EU member candidate countries. The East West trade relationships are still rather weakly developed and there is a statistically significant difference in international trade patterns between the two groups: Bilateral trade relations between the EU member and the CEECs are still less developed than trade relations between the former EU member.

Adam, Kosma and McHugh (2003) explore the effectiveness of CEFTA and BFTA. Estimates from a gravity model and bilateral trade data support the view that both regional agreements helped expand regional trade and limit the emergence of a "hub-and-spoke" relationship between CEECs and the EU. In the regression all the preferential trade agreements variables are positive and statistically significant. The authors conclude that all the agreements were trade creators for their members. The BFTA agreements turned out to be more effective than the CEFTA and interestingly, the parameter estimate for EAs is smaller than either CEFTA and BFTA. Therefore, the bulk of the increase in EU-CEEC trade was due to a return to normal trading pattern rather than to specific trade advantages offered by EAs.

5. Empirical strategy and estimations results

Empirical strategy. The main findings of the empirical literature above are positive and significant coefficients of the dummies representing FTAs. However, those estimates could be seriously biased especially due to the lack of controls for heterogeneity and dynamics. We adopt a gravity model approach, trying to control for all these factors; in this context, we use a "system GMM" dynamic panel data estimator.

The equation have been estimated for the group of the eight CEECs as reporting countries and the EU15 plus the 8 CEECs as trading partners; the time span is 1994-2002.[11]

We introduce in our gravity equation three sets of variables: i) gravity variables, ii) controls for heterogeneity iii) controls for dynamics. Dummy variables to test the effects of FTAs on bilateral trade flows between CEECs and EU15 and CEECs themselves (the importing countries) are also introduced into the estimates.

i) Standard gravity variables. Bilateral distance, as a proxy of transport costs, and importer and exporter's GDP as proxies respectively of demand and production factors. We add to this standard specification an index of relative country size between trading partners.

ii) Controls for heterogeneity. Following Baltagi, Egger and Pfaffermayr (2003) we introduce fixed effects for importing and exporting countries. Unlike these authors, we don't control for country-pair effects (i.e. the interaction effect between exporting and importing country picking up unobserved characteristics of country-pairs) because this kind of variables would include the impact of bilateral trade agreements that we want to control by specific dummies.

Again, with respect to Baltagi et al. (2003), we do not introduce interaction terms between exporting and importing countries and time (*it* and *jt*)[12]. Following Bun and Klaassen (2004), we introduce instead a set of country-pair specific time trend, the reason being that trade flows tend to grow over time.[13]

As Bun and Klaassen (2004) underline, this approach is more flexible in the cross-sectional dimension (*ij*) with respect to Baltagi, Egger and Pfaffermayr (2003) formulation: It allows the trade development over time to be driven by other than national factors (i.e. transportation costs). We impose linearity for trends (at the cost of restricting *it* and *jt* dimensions) instead of allowing for unrestricted time variation (at the cost of restricting the *ij* dimension).[14] The estimates are robust also when we generalized the linearity hypothesis by allowing for quadratic trends.

Controlling for exporter, importer and bilateral time trend effect, we can proxy the multilateral "trade resistance index" (see Anderson and van Wincoop (2003)),

---

[11]. Sensitivity analysis indicates that more stable estimates results are provided using the sample period 1994-2002. We therefore restricted the time dimension of the panel excluding the first and the last year. Table 5 includes estimates for this restricted panel.

[12]. This approach, allowing for each country to have a separate parameter for each time period when *it* is an exporter and another one when *it* is an importer, leads to a maximum flexibility in i_t and j_t dimension of the panel: all possible nation-specific variables can move unrestrictedly over time.

[13]. Although using panel data allows for time effect to correct for any residual trend common to all bilateral trade flows, trends may vary across country-pairs. For instance, transportation costs depend on country-pair distance and the structure of trade; these elements vary between country-pairs. Transportation costs have decreased over time and this could have been increased bilateral trade flows; it is unlikely that standard (common) trend correction could completely avoid omitted trend variables bias.

[14]. Linear trends usually capture the greater part of trending variables.

obtaining a specification of a gravity equation that can be interpreted as a reduced form of a model of trade with micro foundations.[15]

iii) Controls for dynamics. Given the novelty of the phenomenon, traditional static gravity models, that generally deal with long-run relationships, are not well suited to interpreting the repercussions of accession. For this purpose, we need to make the gravity equation more short-run oriented by explicitly introducing dynamics, controlling for the lagged effects of the dependent variable and detecting the short term influences of the "forthcoming accession" and of all other variables affecting bilateral trade in EU enlarged. The "short run" matters in trade analyses: countries trading with each other tend to have an inertial behaviour due to sunk costs.[16]

The introduction of dynamics into a panel data model raises however an econometric problem. If trade is a static process, the "within" estimator (fixed-effect estimator) is consistent for a finite time dimension T and a infinite number of country-pairs N. But if trade is a dynamic process, the estimate of a dynamic panel like our model (a static one with the lagged dependent variable) is more difficult. The reason is that the transformation needed to eliminate the country-pair fixed effects produces a correlation between the lagged dependent variable and the transformed error term that (for a finite T and an infinite N) renders the least square estimator biased and inconsistent.

To avoid this inconsistency problem, Arellano and Bond (1991), suggested to transform the model into first differences and run it using the Hansen two-step GMM estimator. The proposed strategy however is not costless for the gravity model. On the one hand, first-differencing the equation removes fixed effects but also time invariant regressors that are in the specification. On the other hand, first-differenced GMM estimators perform poorly in terms of precision if it is applied to short panels (along the T dimension) including highly persistent time series (Blundell and Bond, 1998).

Arellano and Bover (1995) describe how, if the original equations in levels were added to the system of first-differenced equations, additional moment conditions could be brought to bear to increase efficiency ("System GMM" estimator). They show how the two key properties of the first differencing transformation – eliminating the time-invariant individual effects while not introducing disturbances for periods earlier than period *t-1* into the transformed error term – can be obtained using any alternative transformation (i.e. forward orthogonal deviations).

For all these reasons, the choice of this estimator in our analysis seems to be the right one. As far as we know, the application of this methodology in a gravity context is quite new (De Benedictis and Vicarelli, 2005).

Estimations. Starting from a "traditional" gravity equation (model 1), we move to an "augmented" version including the two dummy variables of interest, separately and together: firstly, the dummy for FTAs among CEECs (model 2), then the dummy for

---

[15]. Anderson and van Wincoop (2003) pointed out that trade between a pair of countries depends on their bilateral trade barriers with all trading partners: trade will be stronger for those countries with a relatively low trade barriers. Rose and van Wincoop (2001) approximate the multilateral trade resistance index using country-pair fixed effects. Ritschl and Wolf (2003) and Estevadeordal et al. (2003) propose using country-group dummies; our approach follow this suggestion.

[16]. Exporters have to bear to set up distribution and service networks in the partner country, leading to the emergence of substantial entrance and exit barriers (Eichengreen and Irwin, 1996).

FTAs among CEECs and EU (model 3) and finally both the dummies together (model 4). In all these estimates we control for heterogeneity and dynamics.

The complete estimated equation form is:

$$\ln\left(Exp_{ijt}\right) = b_1 \cdot \ln\left(Exp_{ij(t-n)}\right) + b_2 \cdot \ln\left(SumGDP_{ijt}\right) + b_3 \cdot \left(Simil_{ijt}\right) + b_4 \cdot \ln\left(Dist_{ij}\right) +$$
$$+ b_5 \cdot FTAP_{ijt} + b_6 \cdot FTAEU_{ijt} + b_7 \cdot \alpha_i + b_8 \cdot \beta_j + b_9 \cdot \tau_{ij}$$

where:

ln = the natural logarithm, *i* is the exporting country, *j* is the importing country and t is the year, n is a lag structure for the dependent variable,

Exp_{ijt} = is the exports in value from country *i* to country *j*;

$SumGDP_{ijt}$ = is the sum of gross domestic product of the exporting and importing countries.

$Simil_{ijt}$ = is the similarity index of two's trading partners GDP as measure of relative country size; it is build as:

$$\left[1 - \left(\frac{GDP_{it}}{GDP_{it} + GDP_{jt}} \right)^2 - \left(\frac{GDP_{jt}}{GDP_{it} + GDP_{jt}} \right)^2 \right]$$

We use the similarity index in natural logs.

$FTAP_{ijt}$ = is a dummy variable that assumes value 0 for the absence of free trade agreements or customs unions among Periphery countries, 1 (year of entry into force) if these agreements are present;

$FTAEU_{ijt}$ = is a dummy variable that assumes value 0 for the absence of free trade agreements or customs unions between Periphery and EU–15 countries, 1 (year of entry into force) if these agreements are present;

α_i = exporting country dummy: assumes value 1 if export flows come from exporter country *i* to each one of importing countries *j*, 0 otherwise;

β_j = importing country dummy: value 1 if export flows come from each one of exporter countries *i* to importing country *j*, 0 otherwise;

τ_{ij} = bilateral trend variables.

We expect that bilateral export flows are positively influenced by:

i) the lagged endogenous variable. Countries trading heavily with each other are expected to continue to trade, thus reflecting the effects of entrance and exit barriers due to sunk costs.

ii) the sum of importing and exporting countries' GDP. In gravity models trade flows are positively influenced by the "mass" proxied by the sum of GDP.

iii) The presence of free trade agreements. These dummies proxy the pure trade effects and are expected to have a positive impact on trade flows.

According to the standard gravity model we also expect that bilateral export flows are negatively influenced by distance. It is used as proxy for transport costs and cultural proximity between two countries;

We have no a priori on the signs of the relative country size index (*Simil*). Therefore, a negative sign of the index favours the classical Heckscher-Ohlin-Samuelson trade theory view that trade rises with relative factor endowment differences. On the contrary, a positive sign supports Linder's hypothesis, which states that trade volumes are smaller the more dissimilar two countries are in terms of relative factor.[17]

Estimation results. Table 5 reports results of the test[18] and the estimates. AR(1) and AR(2) test show the consistency of the GMM estimator and the inconsistency of the OLS procedure. Hence, by introducing dynamics, the proper estimation method is the former one. Sargan test of over-identifying restrictions shows that the hypothesis that all moment restrictions are satisfied for the dynamic specification is not rejected.

In detail:

Gravity "standard" variables. A positive exports relationship with the mass and a negative one with distance is confirmed, in line with empirical literature findings.

The positive sign of the relative country size index suggests that trade relationships are higher the more similar two countries are in terms of country size. This latter result seems to support Linder's hypothesis, like in Baltagi et al. (2003).

The lagged dependent variable is statistically significant considering a 1-period lag; the magnitude of the "persistence effect" is a little bit lower with respect to other findings based on more integrated and developed groups of countries.[19] This gap can be explained by the fact that CEECs are less integrated – in the period under examination they were going through a transition process – than EU15 and by the inclusion of bilateral time trend in the regression, capturing part of the "persistence effect".

FTA-Periphery. The coefficients show that being part of a free trade agreement among periphery countries, compared to not being part to it, increases bilateral trade by around 16 percent.[20]

6. Concluding remarks and policy implications

The continuous rise in the number of FTAs in the last decades of the twentieth century, and the evident difficulties of the multilateral trade system, have given new relevance to the study of the effects of regional integration. The contribution of this paper is to give new and robust evidence of the effects of FTAs in Europe and on the emergence of a hub-and-spoke system in intra-UE trade flows.

---

[17]. The sources of the variables are shown in the Appendix. (table 1)

[18]. Arellano and Bond (1991) propose a test of the hypothesis of no second-order serial correlation in the disturbances of the first differenced equation. This is a necessary condition for the valid instrumentation. The Arellano-Bond test performed for our estimate confirms that the GMM estimator is consistent. A test for the hypothesis of no first order–order serial correlation is also reported: the rejection of the null hypothesis (i.e. the presence of first-order serial correlation) indicates the inconsistency of the OLS estimator.

[19]. See De Nardis and Vicarelli (2003), Bun and Klassen (2002), and De Benedictis and Vicarelli (2005).

[20]. Since the parameter of the dummy *FTAP* is 0.15 (the inclusion of *FTAEU* dummy doesn't change this value significantly), the variation of trade induced by being part of such a trade agreement (FTA=1) with respect to the case of not being part of any agreement (FTA=0), is given, other things being equal, by $[(\exp^{0.15*1}/\exp^{0.15*0}) - 1]*100 = 16.2$ percent.

Table 5 Estimate of bilateral exports coming from CEECs-8, (1994-2002)

Num.obs= 1712	Num group=176	sample period 1994-2002		
	I	II	III	IV
$\ln(Exp_{ij(t-1)})$	0.30*	0.34**	0.30**	0.31**
	(2.33)	(2.62)	(2.53)	(2.64)
$\ln(SumGDP_{it})$	0.4*	0.40 *	0.51**	0.51**
	(2.37)	(2.34)	(2.72)	(2.73)
$\ln(DIST_{ij})$	-1.46***	-1.34 ***	-1.46***	-1.37***
	(5.4)	(5.24)	(5.93)	(5.78)
$\ln(SIMIL_{ijt})$	0.49 **	0.43**	0.57***	0.53**
	(2.81)	(2.57)	(3.24)	(3.07)
$FTAP_{ijt}$		0.16*		0.15*
		(2.27)		(2.24)
$FTAEU_{ijt}$			-0.12	-0.11
			(1.66)	(1.49)
α_i	Yes	Yes	Yes	Yes
β_j	Yes	Yes	Yes	Yes
τ_{ij}	Yes	Yes	Yes	Yes
Sargan test	$\chi^2(46) =38.65$	$\chi^2(46) =42.09$	$\chi^2(46) =36.55$	$\chi^2(46) =39.53$
	$p> \chi^2= 0.77$	$p> \chi^2= 0.64$	$p> \chi^2= 0.84$	$p> \chi^2= 0.74$
Arellano Bond test AR (1)	z=-2.93	z=-3.25	z=-3.21	z=-3.35
	P>z=0.003	P>z=0.001	P>z=0.001	P>z=0.001
Arellano Bond test AR (2)	z=0.43	z=0.41	z=0.41	z=0.37
	P>z=0.664	P>z=0.679	P>z=0.681	P>z=0.712

t values in parenthesis
*p<0.05; **p<0.01, *** p<0.001

Our empirical analysis shows that FTAs enhanced bilateral export flows between the spokes and not between the hub and the spokes. The apparent insignificant impact on export flows of EAs can be explained by the fact that, starting from the end of the eighties, trade between CEECs and EU15 was already intense because reduction of trade barriers had already taken place. This view is in line with the many contributions that emphasized the erosion in the unrealised trade potential of the CEECs with the EU15 already in the early 1990s.

On the other hand, according to our estimates, CEFTA and BFTA increased CEECs trade by around 16 percent, on average. This result seems to confirm some stylised facts. During the CMEA period (and for a while after its collapse in 1991) the trade relations between the CEECs were not driven by economic factors and were not as intense as they should have been. With the start of the integration process with the EU15, the hub has had a gravitational pole, and trade flow were redirected towards the European market. At the beginning of the new century, the role of the EU15 as a hub is still undeniable, but the EAs are not anymore reinforcing the hub-and-spoke structure

of intra-EU trade. The establishment of CEFTA and BFTA restored and developed trade flows between the CEECs also within a broader EU framework. From this perspective, FTAs among spokes limited the reinforcement of a hub-and-spoke relationship between CEECs and EU.

These results have important implications also in terms of Peter Mandelson's will to achieve a truly integrated regional trade system for the EU and its partners. According to our empirical findings, South-eastern European Countries as well as the Southern Mediterranean Countries should move towards a regional free-trade area – as exemplified by the CEFTA and the BFTA – to promote intra-regional trade and to prevent contrast the emergence of a hub-and-spoke structure in regional trade flows.

References

Adam A., Kosma T. S. and McHugh J., (2003), 'Trade-liberalization strategies: What could Southeastern Europe learn from CEFTA and BFTA', *IMF working paper No. 239.*

Anderson J. and van Wincoop E. (2003), 'Gravity with Gravitas: a Solution to Border Puzzle', *American Economic Review*, **93**, 170-192.

Arellano M. and Bond S. (1991), 'Some Tests of Specification for Panel Data: Monet Carlo Evidence and a Application to Employment Equations', *Review of Economic Studies*, **58**, 277-297.

Arellano M. and Bover O. (1995), 'Another Look at the Instrumental Variable Estimation of Error-Components Models', *Journal of Econometrics*, **68**, 29-51.

Baltagi B.H., Egger P. and Pfaffermayr M. (2003), 'A generalised design for trade flows models', *Economic Letters*, **80**, 391-397.

Bhagwati J. (2002), *Free Trade Today,* Princeton University Press, Princeton.

Blundell R. and Bond S. (1998), 'Initial condition and moment restrictions in dynamic panel data models', *Journal of Econometrics*, **68**, 29–51.

Bond S. (2002), 'Dynamic Panel Data Models: A Guide to Micro Data Methods and Practice', *Working paper No.02,* Institute for Fiscal Studies, London.

Brenton P. and Manzocchi S. (2002), '*Enlargement, Trade and Investment*', Edward Elgar, Cheltenham.

Bun M. and Klaassen F. (2002), 'The importance of Dynamics in Panel Gravity Models of Trade', mimeo.

Damijan J.P. and Masten I., (2002), 'Time-dependent efficiency of free trade agreements: The case of Slovenia and the CEFTA Agreement.', *LICOS Discussion Paper No.117.*

De Benedictis L. and Vicarelli C. (2005), 'Trade Potential in Gravity Panel Data Models', *Topics in Economic Analysis and Policy*, **5**, www.bepress.com/bejeap/topics/vol5/iss1/art20

Deltas G., Desmet K and Facchini G. (2005), 'Hub and spoke free trade areas', mimeo.

de Nardis S. and Vicarelli C. (2003), 'Currency Unions and Trade: The special Case of EMU', *Weltwirtschaftliches Archiv/Review of World Economics*, **139**, 625-649.

Egger P. (2004), Estimating Regional Trading Bloc Effects with Panel Data' *Weltwirtschaftliches Archiv/Review of World Economics*, **140**, 151-156.

Egger P. and Pfaffermayr M. (2002), 'The pure effects of European Integration on intra-EU core and Periphery trade', *University of Innsbruck Working Paer No. 1.*

Eichengreen B. and Irwin D.A. (1996), 'The Role of History in Bilateral Trade Flows', *NBER Working Paper No. 5565.*

Estevadeordal A., Frantz A.B. and Taylor A. (2003), 'The Rise and Fall of World Trade, 1870-1939', *Quarterly Journal of Economics*, **118**, 359-407.

Frankel J. and Rose A.K. (2000), 'Estimating the Effect of a Currency Unions on Trade and Output', *NBER Working Paper No. 7857*.

Greenaway D. and Milner C. (2002), 'Regionalism and gravity', *Scottish Journal of Political Economy*, **49**, 574-85.

Kaminsky B. (2001), 'The EU Factor in Trade policies of Central European Countries', mimeo.

Kendall Metcalf L. (1997), *The Council of Mutual Economic Assistance, The Failure of Reform*, Columbia University Press, New York.

Kowalczyk C. and Wonnacott R.J. (1992), 'Hubs and Spokes, and Free Trade in the Americas', *NBER Working Papers No..4198*.

Laaser C. F. and Schrader K. (2002), 'European integration and changing trade patterns: The case of the Baltic States', *Kiel Working Paper No.1088*.

Linder S.B. (1961), *An essay on trade and transformation*, John Wiley, New York.

Paas T. (2003), 'Regional integration and international trade in the context of EU Eastward enlargement', *HWWA Discussion Paper No. 218*.

Puga D. and Venables A. (1998), "Trading Arrangements and Industrial Development.", *World Bank Economic Review*, **12**, 221-49.

Pomfret R. (2003), *The Economics of Regional Trading Arrangements*, Clarendon Press, Oxford.

Ritschl A. and Wolf N. (2003), 'Endogeneity of Currency Areas and Trade Blocks: Evidence from the Inter-War Period', *CEPR Discussion Paper No.4112*.

Rose A. and Van Wincoop E. (2001), 'National money as a barrier to international trade: The real case for currency union', *American Economic Review*, **91**,386-390.

Sobel V. (1990), *CMEA in crisis*, Greenwood ed., Toronto.

Luca De Benedictis, Roberta De Santis, Claudio Vicarelli, Hub-and-Spoke or else?

Appendix:

Table A.1. Source and definitions of variables

variables	source	sample period
Bilateral export flows (current price, US $ millions)	Direction of trade statistics, International Monetary Fund	1990-2003
Free Trade Agreement	European Commission and World Trade Organisation	1990-2003
GDP (curr. price millions US $)	World Economic Outlook database, International Monetary Fund	1990-2003
Distance	Paul Brenton and Francesca Di Mauro http://www.ceps.be	1990-2003
Population	Queen database, Eurostat	1992-2003
GDP per capita	Queen database, Eurostat	1992-2003
Exchange rate	IFS FMI, and BCE	1992-2003

Table A. 2: Share of export to Former CPE and EU**

	*CPE***		EU	
	1988	1992	1988	1992
Czech Rep.	47.7	19.7	38.4	61.8
Hungary	43.6	7.7	39.1	75.1
Poland	35.7	15.7	49.2	62.3
Estonia	n.a.	29.2	n.a.	68.5
Latvia	n.a.	58	n.a.	38.5
Lithuania	n.a.	57.8	n.a.	39.1
Slovak Rep.	n.a.	n.a.	n.a.	n.a.
Slovenia	n.a.	n.a.	n.a.	n.a.

*Excludes intra Czech-Slovak trade, ** CPE is defined as the former Soviet Union (including Baltics), Bulgaria, Czechoslovakia, Hungary, Poland and Romania.*
Source : Hoekman B., Djankov S. (1996)

Table A.3 Trade integration vs EU (% of World total)

	1993			2003		
	EU/W	C/W	P/W	EU/W	C/W	P/W
Czech Rep.	73	48	25	63	51	12
Estonia	39	30	09	81	67	14
Hungary	35	34	1	66	60	6
Latvia	43	33	10	83	67	16
Lithuania	47	36	11	53	39	14
Poland	71	67	4	77	66	11
Slovak Rep.	79	28	51	65	46	19
Slovenia	55	54	1	63	56	7

W stands for World..
Source: our elaboration on IMF data