Oesterreichische Nationalbank
Conference on European
Economic Integration

November 28 to 30, 2004, Vienna

Trade Integration of the New EU Member States and Selected South Eastern European Countries: Lessons from a Gravity Model

Jarko Fidrmuc

Economist

Oesterreichische Nationalbank

Preliminary

Trade Integration of the New EU Member States and Selected South Eastern European Countries: Lessons from a Gravity Model*

This version: 22 November 2004

Matthieu Bussière[a], Jarko Fidrmuc[b], Bernd Schnatz[a]

Abstract

The rapid integration of the transition countries of Central and South Eastern Europe with the euro area is one of the most striking developments that affected trade flows in Europe over the past decade. The aim of this paper is to analyse the factors behind this quick integration and to gauge whether this pattern is likely to continue or to slow down in the coming years. For that purpose, we estimate a large gravity model. Furthermore, the issues related to the interpretation of fixed effects are discussed. Overall, the gravity model successfully explains the trade patterns observed in the past ten years. Although our results require a cautious interpretation, they suggest that trade integration between the largest Central and Eastern European countries and the euro area is already relatively advanced, while these countries still have scope to strengthen their trade links with countries in many other parts of the world. Thus, we conclude that market shares of these countries in the euro area are likely to stabilise soon. For the South Eastern European countries, by contrast, there is still ample scope to integrate more into the world economy.

JEL: C23, F15, F14.

Keywords: gravity model, panel data, trade, Central and South Eastern European countries, emerging markets, free trade agreement.

* We have benefited from comments by Stelios Makrydakis and Doris Ritzberger-Grünwald. The views expressed in this contribution are those of the authors and do not necessarily represent the position of the European Central Bank or the Oesterreichische Nationalbank.

[a] European Central Bank.

[b] Oesterreichische Nationalbank, Foreign Research Division and Comenius University Bratislava, Faculty of Mathematics, Physics and Informatics, Institute of Applied Mathematics and Statistics.

1. Introduction

Over the past ten years, Central and Eastern European Countries (CEECs) and the Balkan Countries experienced a rapid trade integration with the euro area, which had two major implications. First, from a euro area perspective, the share of these countries in extra-euro area trade[1] has almost doubled between 1993 and 2003, from 7% to 13%.[2] Taken as an aggregate, the CEECs and the Balkan countries now represent the euro area's third largest trading partner behind the United Kingdom (15.8%) and the United States (13.6%). Second, from the perspective of these countries, the euro area represents the most important trading partner. The share of the euro area in the Czech Republic, Hungary, Poland, Slovenia and Romania (measured as percentage of imports and exports of these countries), is close to 60%; for Albania it reaches almost 80%, while for Bosnia, FYR Macedonia, Bulgaria and the Slovak Republic it is closer to 50% but quickly rising.

The natural question that arises from these stylised facts is whether the increasing integration of the CEECs and the Balkan countries with the euro area is likely to continue in the years to come, or rather to slow down. The answer to this question depends to a large extent on the interpretation of past developments. Clearly, the fact that integration between Eastern European transition countries and the more mature economies of the euro area has increased in the 1990s should not, by itself, come as a surprise. The sheer geographical proximity of these countries, the large economic weight of the euro area and the rapid economic catching up of the transition economies are three likely factors accounting for this development. In addition, the transition process itself – combined with the removal of trade hurdles through accession to the European Union – most certainly further enhanced trade between these two groups of countries. An open question, though, remains: Is the rise in market shares observed so far largely coming to an end or is it still likely to continue? This requires having a view on what would constitute "normal" trade relationships for these countries with the euro area.

The aim of this paper is to set up a methodological framework to tackle this question empirically. For that purpose, the paper uses a standard gravity model, where trade between country pairs is modelled as a function of their economic size and of the geographical distance between them. While this standard and relatively simple model constitutes a useful starting point, the paper enriches this model by adding other variables such as dummy variables for common language or common border, free trade agreement dummy variables, the exchange rate and foreign direct investment (FDI) flows. These additional variables extend the scope of the standard model and allow to discuss a wide range of issues related to the transition process. As published papers on the subject often use fixed effects (to account for unobservable factors), the paper discusses the implication of using fixed effects in the particular case of transition economies.

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[1] Extra-euro area trade refers in the paper to the sum of total euro area exports and imports, excluding trade between euro area countries (referred to here as intra-euro area trade).

[2] We focus on the period 1993-2003 as data for transition countries before 1993 are scarce and volatile.

To estimate the model, we use a database of bilateral trade flows across 61 countries, observed at annual frequency over the period 1980-2003. Estimations are therefore performed with roughly 50,000 observations, which is more than in most studies on the subject. Pooling together so many observations has two main advantages: first it yields tightly estimated coefficients and second, it allows us to draw from the experience of other dynamically developing countries at a similar stage of economic development. The model's performance in terms of goodness of fit is found to be highly satisfactory as the right-hand side variables explain a significant share of the variance of the dependent variable. The model also successfully passes several robustness tests. A detailed analysis of the predicted values for the three largest euro area countries yields two key results. First, the predicted values of trade flows between France, Germany and Italy with other large industrialised economies are close to the model's predictions. This result is intuitive as one would expect that trade flows between mature economies should be close to their "normal" level in the long-term, and are therefore more amenable to estimation with a gravity model. Second, the ratio of predicted to actual trade flows between the euro area's three largest economies on the one hand and the CEECs on the other hand has been sharply falling throughout the 1990s. As argued in the paper, the level of this ratio is difficult to interpret due to specific econometric problems. Yet, the evolution of this ratio through time can give an indication that the CEECs were trading below potential in the early 1990s, and that the gap has been narrowing since then.

The rest of the paper is organised as follows. Section 2 analyses stylised facts on the issue. Section 3 reviews the existing literature on gravity models – focusing predominantly on Central and Eastern European countries – and introduces the gravity model. Section 4 reports the results and Section 5 concludes.

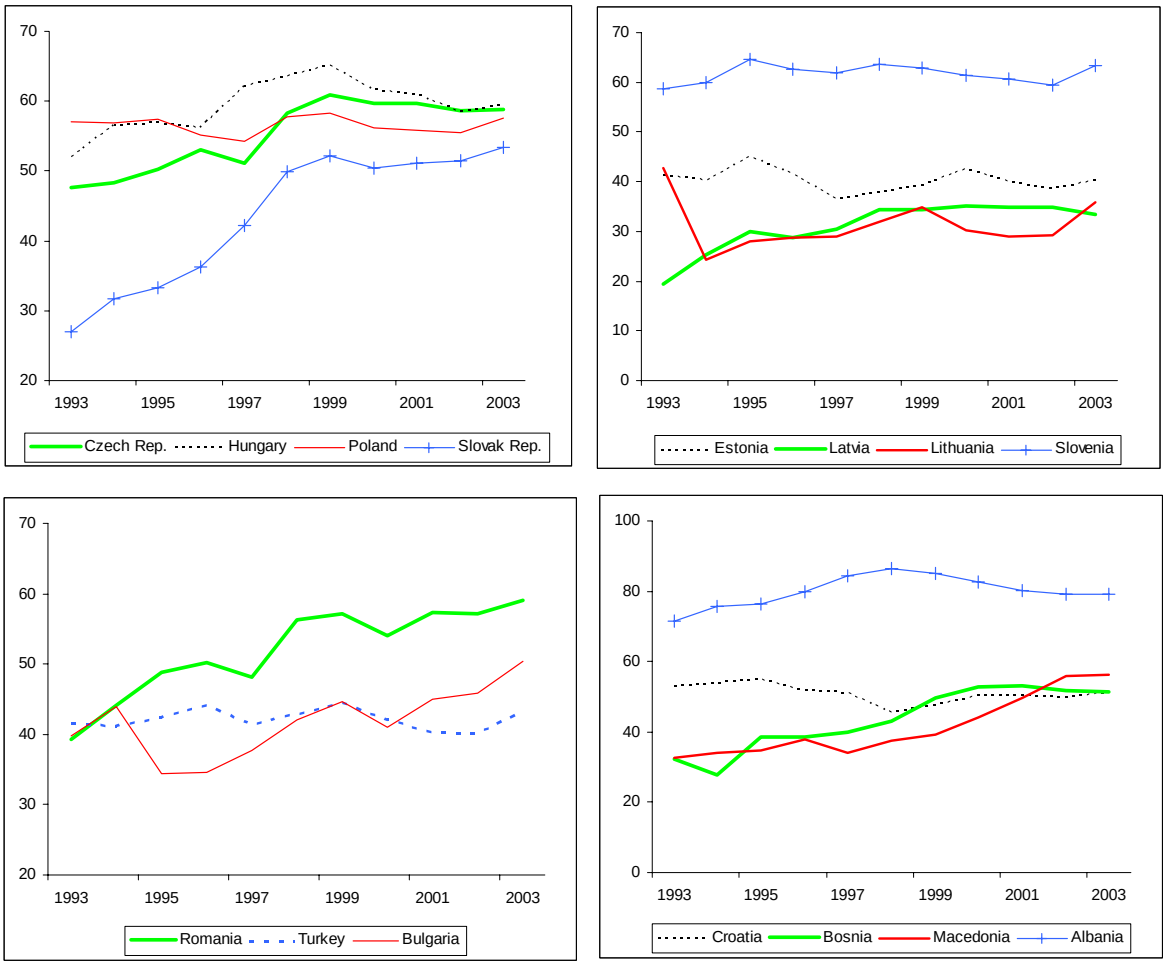
2. Stylised facts: Trade between the euro area, new EU Member States and Balkan countries

For the countries of Central and Eastern Europe, the euro area represents the most important trading partner. In the case of the Czech Republic, Hungary, Poland, Romania, Slovakia and Slovenia, for instance, trade with the euro area now amounts to nearly 60% of their total trade (see Chart 1). In the case of the Slovak Republic, trade with the euro area started from a relatively low level in 1993 (less than 30%) and quickly increased in the following ten years. The magnitude of the increase was also high for Romania, whose trade share with the euro area rose from 40% to 60% over the same period. For the countries that were already trading a lot with the euro area in 1993 (like Slovenia, Hungary and Poland), the share of the euro area seems to have remained roughly constant in the past ten years. In the particular case of Hungary, the share of the euro area in foreign trade rose above 60% in the late 1990s but abated somewhat since then. The pattern observed on Chart 1 would therefore suggest that the share of the euro area external trade in the above mentioned countries tends to converge towards a common level. However, there are some exceptions to this general pattern. In the Baltic countries, for example, the share of the euro

area in foreign trade is significantly lower (around 40%) and seems to remain stable at that level. Similarly, the market share of the euro area in Turkey has remained stable in the past 10 years at around 40%. To anticipate the analysis of the gravity model that will be developed in the following sections, one could partly attribute the lower share of the euro area in the Baltic countries and in Turkey to their higher distance with the euro area.

Chart 1: The importance of the euro area for CEECs

Share of trade flows with the euro area as a percentage of total trade flows (exports + imports)



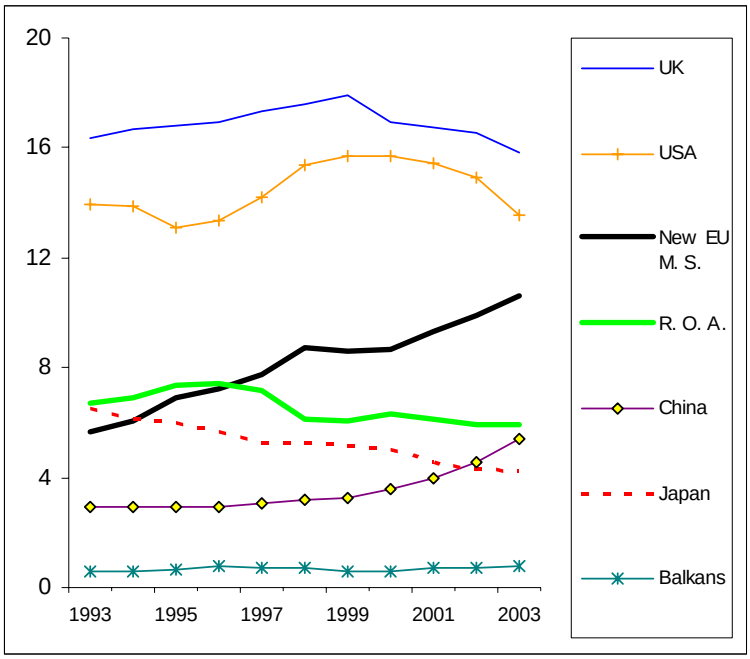
The large share of euro area trade in the new EU Member States reflects predominantly the high weight of Germany. Table 3 in the Appendix, which provides a detailed breakdown of the geographical decomposition of trade by partner country in 2003, reveals for instance that the share of Germany in these countries is higher than the share of Italy (Romania being a noticeable exception). The table also shows that trade with other new EU Member States is still large for many of them, particularly the Czech Republic and the Slovak Republic due to their common history. Also, the table indicates that the share of Russia in the CEECs remains high (5% on average, which is more than the UK and the US), especially for the Baltic countries (where Russia's share is above 10%), reflecting the importance of distance and cultural links among the determinants of trade.

Turning to the Balkan countries, the share of the euro area is quickly rising in Bosnia and in Macedonia (from 30% in 1993 to roughly 50% in 2003), while for Croatia it has remained roughly stable at 50% in the past 10 years. Albania has the highest share of trade with the euro area at nearly 80%. Yet, by contrast with the other countries, this reflects mostly trade with Italy (more than 50%) and Greece (at around 20% in the late 1990s and slightly less in the past two years), rather than trade with Germany.

The strong concentration of these countries' foreign trade with the euro area raises the question whether the trade structure of some transition countries is already "too heavily" oriented towards the euro area (compared to the outcome of a trade model) as suggested by e.g. Fidrmuc and Djablik (2004). Such a hypothesis appears to be also supported by the patterns of the Czech Republic and Hungary, which experienced a slight reduction of trade shares with the euro area in recent years.

From a euro area perspective, the most noticeable changes that occurred in the past ten years are an increase in the market shares[3] of the new EU Member States and of China – providing an unprecedented example of integration dynamics (see Djankov and Hoekman, 1997) – and a continuous decrease in the share of Japan (see Chart 2). Between 1993 and 2003, the share of the new EU Member States in extra-euro area trade has almost doubled, from 5.7% to 10.6%. Overall, the new EU Member States increased their market shares in the euro area countries almost continuously, with the exception of 1999 and 2000 when it temporarily levelled off. More recently the prospect of the EU membership might have given a new impetus to these dynamics.

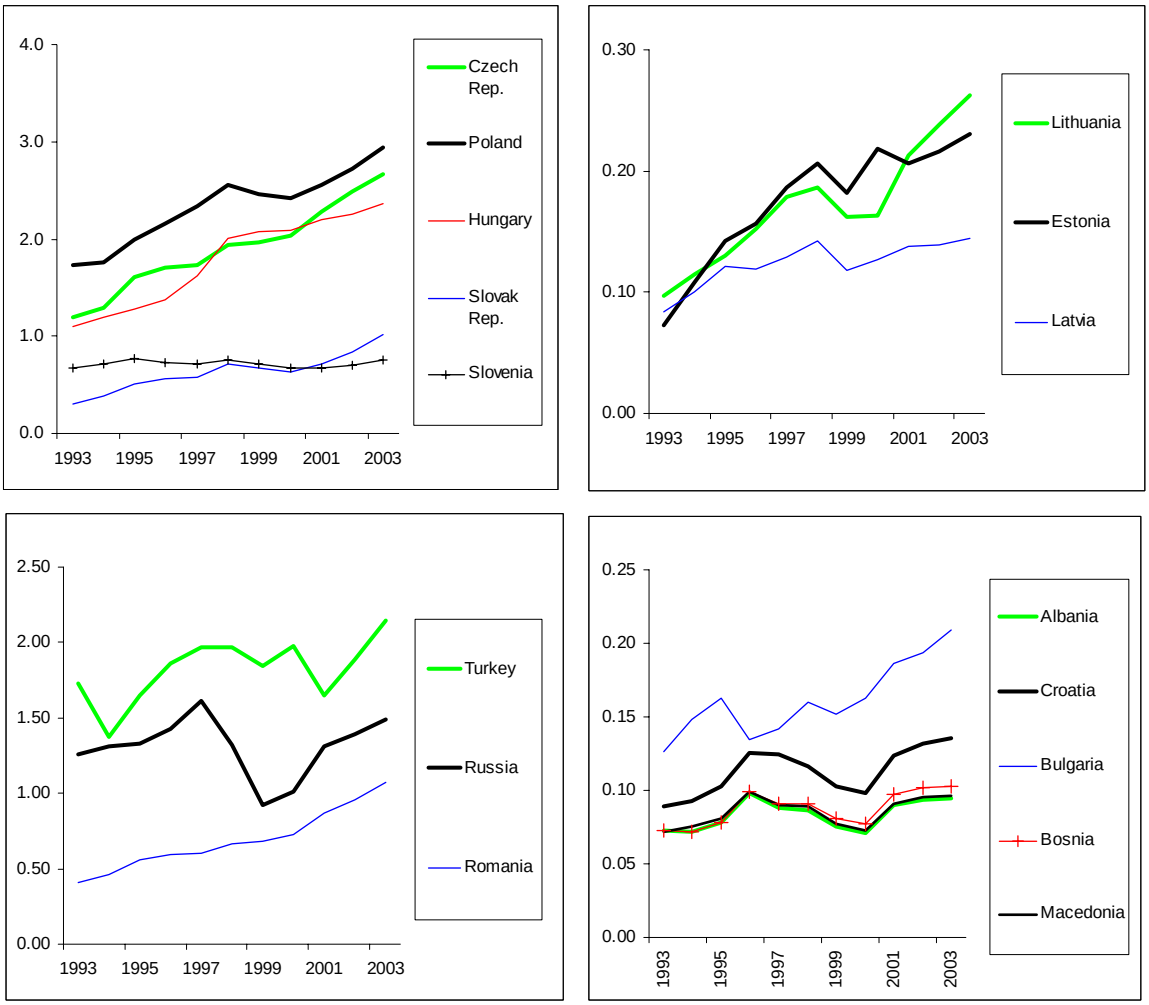
Chart 2: Share of key euro area trading partners in euro area trade
Percentage of total extra-euro area trade



[3] Market shares refers to the percentage of trade (imports + exports) with a particular country relative to total trade.

Trade between the euro area and other candidate and accession countries (Bulgaria, Croatia, and Romania) has also increased substantially in recent years – similarly to the experience of the new EU Member States in previous years (see Chart 3). Finally, bilateral trade with other countries in Southern Eastern Europe (Albania, Bosnia-Herzegovina, and FYR Macedonia) has started to pick up since 2000, raising the question whether these countries may experience a similar dynamic development of their trade with the euro area as the new EU Member States did in the past decade.

Chart 3: Shares of CEECs in euro area trade
Percentage of total extra-euro area trade

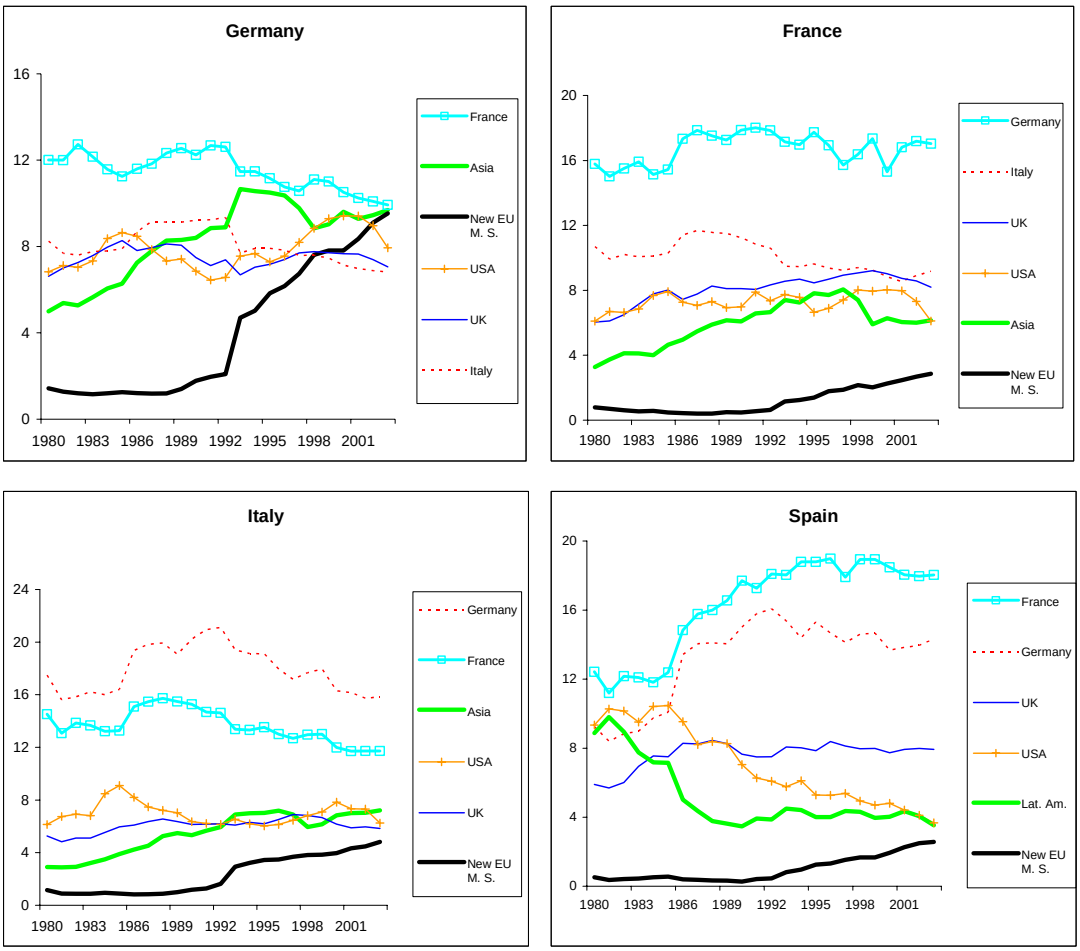


Taken together, the CEEC and the Balkan countries are a fairly important trading partner of the euro area. In 2003, the region as a whole has traded roughly as much with the euro area as the United States (13.6%) and significantly more than Japan (4.3%), China (5.4%) or Russia (1.5%), but it is still less important than the United Kingdom (15.9%). Among the CEECs, the market shares of Poland, the Czech Republic and Hungary in the euro area are between 2-3%, while the other shares of the other CEECs are commonly at or below 1% (Chart 3).

Looking at developments in individual euro area countries (Chart 4), trade with the new EU Member States rose particularly strongly for Germany, where the share of these countries

together is now the highest (with the share of France) and higher than that of the United States or the United Kingdom. By contrast, the share of the new EU Member States in Italy and France is lower than for Germany. For France and Italy, Germany is still the most important trading partner. In the case of Spain, it is also remarkable that trade with other EU countries rose markedly after Spain's EU accession in the second half of the 1980s while, correspondingly, trade with the United States and Latin America declined.

Chart 4: Shares of key trading partners for major euro area countries
Percentage of total trade



Finally, it is worth mentioning the role of FDI for the CEECs. Table 2 in the Appendix reports FDI outflows of the six largest world economies by destination. Each row represents the investment made by the country listed in the first column in the country listed in the first row. Table 2a presents the numbers in billions of USD while Table 2b expresses the same numbers as percentage of the total FDI flows of the countries listed in the first column. In addition to reporting investment to 18 destinations, the tables also report investment to three aggregate regions: the euro area (EA), the European Union (EU) and the difference between these two ("pre-ins"). To account for the volatility of FDI flows, the table reports the sum of annual flows over the period 1995-2001. As the numbers correspond to changes in assets they are not

necessarily positive: they can be negative if the source country sells more assets than it buys in the particular destination.

Several lessons can be drawn from these tables. First, Germany invested much more than any other country in CEECs, both in absolute value and in percentage of total FDI outflows. Second, France and Italy, by comparison, invested much more in the UK and the euro area. The only exceptions are Poland, where France invested as much as Germany, Bulgaria, where Italy was the largest investor and Romania, where France invested more than Italy and Germany together. Last, investment from the other large industrialised countries (UK, US and Japan) in CEECs was rather low. Both the UK and Japan invested a sizeable fraction of their total FDI in the US (around 40%), while 50% of US investment went to the European Union. These developments are consistent with the trade patterns observed above, in particular with the predominant weight of Germany in CEECs trade.

In sum, the stylized facts on trade between the euro area and the CEECs and Balkan countries show significant adjustments over the past decade. The new Member States gained dynamically market shares in the euro area and *vice versa*. This raises the question whether the integration of these economies with the euro area and, more generally, into the world economy is already at an advanced stage, or whether more integration can be expected. In the following, this is assessed quantitatively on the basis of a gravity model which explains trade between countries or regions as a function of other economic fundamentals.

3. Empirical methodology: The gravity model

Gravity models, which were originally proposed by Linder (1961) and Linnemann (1966), have become one of the most commonly used workhorse models to analyse patterns in international trade. By analogy with Newton´s theory of gravitation, gravity models express bilateral trade as a function of two key variables: the economic size of the two countries engaged in trade and the distance between them. Gravity models, which in their most general form suggest that the magnitude of trade between two countries depends on the supply conditions in the source country, the demand conditions in the host country and other factors which may stimulate or hinder bilateral trade, are consistent with standard models of international trade (see Deardorff, 1995, and Anderson, 1979, Anderson and van Wincoop, 2003). This type of model can be directly related to the above mentioned stylised facts. The relevance of economic size is apparent from the fact that the larger CEECs (Poland, Hungary, the Czech Republic) are more important in euro area trade than the smaller ones. At the same time, distance seems to be a good candidate for explaining the comparatively smaller weight of the euro area in the trade share of the Baltic countries. Both distance and economic size could explain why Germany has a much larger trade share in the CEECs than France and Italy.

The standard model can be further enriched with additional variables, as trading costs are not restricted to the cost of physically shipping goods, but also encompass other transaction costs. Accordingly, in the academic literature, four variables are commonly added to the analysis (see, e.g. Cheng and Wall 2004). Firstly, it is likely that countries sharing the same language trade more with each other than otherwise. This may be partly related to historically established trade ties if these countries constituted colonies in past centuries. The common language dummy variable could for instance explain the relatively high share of Latin America in Spain. Secondly, if two countries were part of the same territory (which may be important for some countries under closer examination in this study like the Balkan or the Baltic countries), they may still have closer trade ties than otherwise (history matters). Thirdly, if countries share a common border, transaction costs may be reduced beyond the mere distance factor, translating into a higher bilateral trade. The common border dummy variable may for instance partly explain why the share of the new EU Member States in Germany is roughly as important as that of the United States in spite of their smaller economic size. Finally, the accession to a free trade arrangement can be expected to stimulate trade among the constituent countries, as the rise of Spanish trade with the euro area in the second half of the 1980s may illustrate (see Chart 4).

In view of their practicality and high explanatory power, gravity models have been applied to the particular case of Eastern European countries in several studies. Hamilton and Winters (1992) and Baldwin (1994), two of the most influential early studies in the field, showed that trade of the Eastern European countries (excluding Yugoslavia) with developed countries has been only a fraction of potential trade. Baldwin's results showed that actual trade with the EU12 was up to 5 times smaller than potential trade for Bulgaria and former Czechoslovakia in 1989. Some Central European transition economies were found to be much closer to equilibrium (this is the case of Hungary, with a ratio of potential to actual trade of 1.8), while countries like Romania and Albania, which did not participate in the Council of the Mutual Economic Assistance, started trade liberalization with regional trade structures closer to the gravity predictions estimated by Baldwin. Hvrylyshyn and Al-Atrash (1998) found that Romania achieved a significantly higher actual share of trade with the EU than predicted by the model in 1996. Kaminski et al. (1996) and Jakab et al. (2001) suggest a rapid convergence towards trade potential levels ny non-EU countries which have a trade agreement with the EU (so-called associated countries).[4] Egger (2003) and Fidrmuc and Fidrmuc (2003) found trade between the EU15 and the CEECs close to the predicted level at the end of the 1990s.

The literature on the Balkan countries is rather scarce compared to the literature on new EU Member States. To our knowledge, the only studies that analyse trade potentials for the entire South East European region are Christie (2002 and 2004). His results show significant differences of the actual trade from the potential values. The lack of transport infrastructure is

[4] Associated countries refer to countries that are not members of the European Union but were part of a trade agreement with the EU.

identified as a major obstacle to trade both within the region and with the developed countries. Vujčić and Šošić (2004) present gravity estimates for Croatia. However, these studies do not employ fully the panel dimensions of their datasets. Furthermore, they do not present a broader comparison with other regions. Such comparison would bolster the results and put them in perspective.

Nevertheless, Christie (2002) and Vujčić and Šošić (2004) identify overwhelming trade potentials, to a large extent as a result of tariff and non-tariff trade barriers introduced during the 1990s. Croatia, for example, joined only recently the WTO, and free trade agreements between the Balkan countries are not yet implemented. It follows that especially the EU is likely to play an important role for the countries, which liberalised trade with the Western Balkan region (Albania, Bosnia and Herzegovina, Croatia, Macedonia, and Serbia and Montenegro) by an autonomous trade concession in 2000. Furthermore, several countries of the region aim to join the EU as soon as possible.[5] The regional market is less attractive for the regional neighbours due to new trade barriers and income declines during the 1990s.

Econometric issues

Estimating the gravity model and assessing trade patterns on the basis of the empirical results is subject to several econometric challenges. In the recent literature on gravity models, most papers have focused on the *impact* of policy variables such as common borders, free trade areas or the participation in a currency union on international trade instead of the structure of trade *per se*.[6] Many papers using the gravity approach still employ either a cross-section or a pooled OLS specification, and often ignore heterogeneous characteristics altogether. Other authors employed averaged data over longer periods (see Hamilton and Winters, 1992) or repeated cross section regressions (Fidrmuc and Fidrmuc (2003)) to account for structural changes in the trade of newly independent countries.

Failing to account for unobserved country heterogeneity can lead to distorted estimates. Serlenga and Shin (2004) as well as Cheng and Wall (2004) demonstrated that ignoring heterogeneity translates into biased estimates of bilateral trade relationships. In the cross-section context, Anderson and van Wincoop (2003) extended the standard gravity model by including a so-called multilateral trade resistance term, which may be covered by country dummies (see also Feenstra, 2002). Similarly, Mátyás (1997, 1998) extended a standard gravity model with two sets of country dummies (for exporting and importing countries).[7] Subsequent research on panel estimators (see Egger and Pfaffermayr, 2002) showed, however, that instead of using one dummy

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5 Croatia received a candidate country statute in 2004. In the same year, Macedonia applied for EU membership.

6 See Egger (2004) on FTA and Rose (2000) on currency union. Exceptions from this mainstream of applied trade analysis are Cheng and Wall (2004) and Fidrmuc (2004).

7 This approach is being referred also to as triple indexed error composition model (that is, using two country dimensions and the time dimension). However, these estimates are still based on pooled versions instead of panel versions of gravity models.

variable per country, individual country pair dummies (fixed effects) should be included to get efficient estimators. For instance, the euro area may trade with two other countries different amounts, even though the two partner countries have the same economic size, are equidistant from the euro area and share many other characteristics. These specifications, which usually include time dummies as well, fully utilize panel dimensions of trade flows between countries.

Another potential caveat of standard estimation techniques is that it cannot be ruled out that some of the right-hand side variables have some endogenous characteristics. For instance, the establishment of free trade areas may also depend on the initial level of bilateral trade between two countries. In the context of discussions about the trade effect of EMU, for instance, Micco et al (2003) suggest that countries constitute a common club if they have been already engaged a lot in trade with each other before. In short, unusually high trade flows may lead to the establishment of a free trade arrangement rather than *vice versa*.

Against this background, the following analysis is based on panel data econometrics which takes country-specific effects into account, which – as emphasised by Micco et al. (2003) and Cheng and Wall (2004) – should reduce both the heterogeneity bias and the endogeneity bias (the intuition being that fixed effects take into account whether two countries have traditionally traded a lot). Moreover, we check the robustness of the results by employing alternatively dynamic OLS as suggested by Kao and Chiang (2000).

Taking the time series dimension into account by pooling the data is, however, still subject to several drawbacks: (a) The inclusion of fixed effects normally does not allow estimating the coefficients of the time-invariant variables (such as distance) which enter directly into the fixed effect. (b) The variables entering the gravity model may contain a unit root, requiring cointegration analysis instead of standard panel estimation techniques (Faruqee, 2004). The first point is taken into account by using the two-step procedure presented below. In order to account for possible non-stationarity in the data, the results of the fixed-effects estimator are compared with the results of the dynamic OLS specification (Kao and Chiang, 2000).

In more formal terms, the gravity equation we estimate can be expressed as follows:

$$t_{ijt} = \alpha_{ij} + \theta_t + \beta_1 y_{it} + \beta_2 y_{jt} + \beta_3 d_{ij} + \beta_4 q_i + \beta_5 q_j + \beta_6 \sigma_{ij} + \sum_{k=1}^{K} \gamma_k Z_k + \varepsilon_{ijt} \tag{1}$$

where t_{ijt} corresponds to the size of bilateral trade between country i and country j at time t, y_{it} and y_{jt} stand for the (real) GDP in the source country i and in the host country j, respectively, at time t, d_{ij} is the distance variable, Z_k reflects cultural, historical and political factors affecting bilateral trade between two countries. Consistent with the arguments made before, β_1 and β_2 are expected to be positive while β_3 should be negative. As standard in the literature, trade is defined as the average of exports and imports (in logs) and distance is measured in terms of great circle distances between the capitals of country i and country j (in logs). Obviously, this measure is not without problems as it implicitly assumes that overland transport costs are comparable to oversea

transport costs. Moreover, it assumes that the capital city is the only economic centre of a country which is probably more appropriate for small than for large countries. Following Micco et al. (2003) and Graham et al. (2004), we also include the real exchange rate q of each country against the USD, mainly to control for valuation effects as all trade data are expressed in US dollar terms. A real depreciation of a country's currency against the US dollar would tend to lower the US dollar value of its trade, thus, the sign of β_4 and β_5 should be positive. Moreover, we include the standard deviation of the month-on-month log changes in the bilateral nominal exchange rate within a year (σ) as a proxy for exchange rate volatility and expect a negative sign for β_6. As discussed above, four additional factors possibly affecting bilateral trade were considered by including dummy variables for country-pairs: (1) a common language, (2) a common border, (3) been part of the same country or multinational federation in the past, and (4) membership free trade areas. Accordingly, all γ_k are expected to have a positive sign.

The terms α_{ij} are the country-pair individual effects covering all unobservable factors related to trade resistance including tariff and non-tariff trade barriers, geographical position, and openness to trade in general, as it is unlikely that Z_k encompasses all cultural, historical and political factors, which are intrinsically difficult to measure in practice. To a large extent, it should also account for the drawbacks of the distance variable discussed above and for any other non-observable characteristics. Accordingly, Cheng and Wall (2004) label the fixed effects a "result of ignorance", although – as argued below – they may still entail useful information. θ_t are the time-specific effects – controlling for common shocks or the general trend towards "globalisation"– and ε_{ij} is the error term. In more general terms, these time-dummies account for any variables affecting bilateral trade that vary over time, are constant across trading-pairs and have not been included in the list of explanatory variables such as global changes in transport and communications costs.

In terms of econometric methodology, we first estimate the regression using the standard fixed-effects estimator. As the time-invariant variables are colinear with the country-pair individual effect, which precludes the estimation of coefficients for d_{ij} and Z_k (except the dummies for the free trade areas) we follow Cheng and Wall (2004) and estimate an additional regression of the estimated country-pair effects on the time-invariant variables in order to filter out the importance of these variables in the fixed effects.

$$\hat{\alpha}_{ij} = \beta_3 d_{ij} + \sum_{k=1}^{K} \gamma_k Z_k + \mu_{ij} \tag{2}$$

4. Data and estimation results

Data

The dataset includes annual data from 1980 to 2002. By the end of the sample period, it comprises 61 countries as some countries – particularly the economies in transition – enter the dataset only in the 1990s after the fall of the iron curtain and when some countries were established. This amounts to more than 50,000 observations and more than 3,500 bilateral trade relationships. Trade data are mostly compiled from the IMF Direction of Trade Statistics; they are expressed in US dollars and deflated with US consumer prices. GDP data come from the IMF International Financial Statistics and are deflated with US CPI. Missing data for some Balkan countries have been included from the WIIW and EBRD Transition Reports. Exchange rate volatility is defined as the standard deviation of the month-on-month log changes in the bilateral nominal exchange rate within a year. The distance term reflects the aerial distance between the capital of the two countries under consideration and comes from Fidrmuc and Fidrmuc (2003) and the MS Encarta World Atlas software.

The dummy variable for common territory includes countries which constituted in the past 20 years at some point a common country. More specifically, they include the former Czechoslovakia (the Czech Republic and the Slovak Republic), countries of the Former Soviet Union (Belarus, Estonia, Latvia, Lithuania, Moldova, Russia, and the Ukraine), and countries of Former Yugoslavia (Bosnia, Croatia, Macedonia, Slovenia). Overall, there are 56 country pairs which were part of the same nation state at some point in recent history. For the common language dummy, the variable was equal to one if in both countries a significant part of the population speaks the same language (English, French, Spanish, Portuguese, German, Swedish, Dutch, Chinese, Malay, Russian, Greek, Arabic, Serbo-Croatian or Albanian). Some countries even enter more than one language grouping, such as Canada, where both English and French are native idioms or Singapore, where English, Chinese and Malay are commonly understood languages. Overall, there are 274 country pairs in which the same language is spoken. The dummy variable for having a common border refers to 179 land borders shared by the countries included in the sample. Finally, dummy variables have been included for the most important free trade arrangements, namely the European Union, Asean, Nafta, Mercosur and Cefta.

Estimation results

Table 1 presents the estimation results. The first column shows the results following the fixed effects (FE-) formulation, which is suggested by Cheng and Wall (2004). In the first step, a regression excluding all time-invariant variables was run including as many country pairs as

possible. The exchange rate volatility variable was excluded, although it was significant at the margin because it was inconsistently signed. The free trade areas have been introduced or have expanded during the analysed period; hence, they were included already in this step. The results suggest that all variables included in the specification (except the EU dummy) have the expected sign and are statistically significant.

Table 1: Estimation Results

	FE (1st step)	FE (2nd step)	RE	OLS	DOLS (1st step)	DOLS (2nd step)	FE (1st step)	FE (2nd step)
	full sample	full sample	full sample	full sample	full sample	full sample	OECD	OECD
y_I	0.592**		0.869**	0.935**	0.635**		0.578**	
y_j	0.532**		0.842**	0.921**	0.504**		0.600**	
Distance		-0.696**	-0.862**	-0.834**		-0.689**		-0.594**
Territory		0.09	1.324**	1.934**		0.126		--
Border		1.016**	0.576**	0.345**		1.010**		0.724**
Language		1.298**	1.093**	0.828**		1.288**		0.354**
EU	-0.014		0.028	0.170**	-0.043		0.219**	
Asean	0.450**		0.408**	2.094**	0.406**		--	
Mercosur	0.244*		0.191**	0.713**	0.206*		--	
Cefta	0.218**		0.228**	0.832**	0.231**		--	
Nafta	0.450**		0.529**	0.270*	0.446**		0.201**	
RER1	0.039**		0.077**	-0.017	0.104**		0.198**	
RER2	0.052**		0.095**	0.004	0.037**		0.291**	
R^2	0.63	0.33	0.80	0.81	0.64	0.33	0.67	0.60
N	52683	3462	52614	52614	43976	3352	10034	458

** = Significant at the 1% level,
* = Significant at the 5% level.
FE = fixed effects, RE = random effects, DOLS = dynamic OLS.

As an alternative to the FE-specification, the coefficients for the time-invariant variables could be estimated by using a random effect (RE-) model, which assumes that explanatory variables are uncorrelated with random effects. The Hausman test ($\chi^2(31) = 1775.7$) strongly suggests that this assumption is violated in gravity models, yielding inconsistent estimates. Correspondingly, the coefficient estimates of the RE-model also diverge notably from the fixed effects specification.

The fixed effects model confirms that both domestic and foreign real GDP have a highly significant and less-than-proportional impact on bilateral trade. The magnitude of the coefficients suggests that a one percent increase in economic activity at home or abroad should raise bilateral trade by about 0.55 to 0.6%. The real exchange rate variables also enter the regression significantly – consistent with our concerns about valuation effects – but their coefficients are fairly small. The dummies for free trade arrangements enter significantly and with the right sign, with the exception of the EU dummy, which is not significant in this specification. The marginal effect of the dummy variables can be calculated by taking the exponential of the estimated coefficient minus one: a coefficient of 0.5 means that when the dummy is equal to 1, trade increases – ceteris paribus — by 65% ($e^{0.5}$ - 1= 0.6487) and a coefficient of 0.25 implies a 28% increase.

The overall R-squared of the FE-regression amounts to 0.63 – reflecting a "within" R-squared of 0.43 and a "between" R-squared of 0.63 – suggesting that even such a fairly simple specification of international trade is able to explain a significant part of the variation in international trade. However, there is still sizeable variation in the fixed effects and in the error term. The latter amounts to 0.51, implying that at the one standard error band trade may be 65% higher or lower than the central estimate. The time dummies (not reported) are increasing over time, thereby encompassing the rise in international trade owing to globalisation over the past 25 years. In the second stage of the regression, the distance term is strongly negative, implying that trade between two countries is almost 70% higher if the country is half as distant as another otherwise identical market. Similarly, having a common border roughly doubles trade between the two countries and speaking the same language raises trade by another 130%. The adjusted R-squared in the second-stage regression is 0.33, implying that these factors explain roughly one-third of the distribution of the country-specific factors.

Comparing these results with the pooled OLS estimator (which excludes country-specific effects), as employed in the earlier papers in the literature surveyed in the previous sections, also provides interesting results. The regression explains more than 80% of the variance of trade flows between the countries and the variables are correctly signed and highly significant. Adjacency, common language or a common history increase bilateral trade. Similarly, free trade areas are found to increase trade between the constituent countries. By contrast, other variables, e.g. exchange rates, remain insignificant in this standard specification. However, the magnitudes of the coefficients are notably different from those in the FE-estimation suggesting that the bias introduced by neglecting country-pair specific factors is not negligible.

The robustness of the coefficient estimates is broadly confirmed by our sensitivity analysis: First, in order to account for possible non-stationarity in and cointegration among the variables of the gravity model – as suggested by Faruqee (2004) – panel dynamic OLS (DOLS) have been estimated (using a balanced panel excluding the CEECs). In this context, Kao and Chiang (2000) show that the FE-estimator, while being asymptotically normal, may be asymptotically biased. Moreover, panel DOLS take into account the potential endogeneity of the variables as well as the presence of serial correlation by including leads and lags of the differenced explanatory variables as additional regressors. The DOLS results in Table 1 are very close to the results of the FE-estimator suggesting that the potential bias from the FE-specification should be small.[8]

As a second robustness check, the sample was reduced to include only the OECD countries in the FE-estimation. In this specification, several variables used in the full model drop out in this specification owing to missing observations. In more detail, there are obviously no trade relationships simultaneously within Mercosur or Cefta and the OECD. There is also no case of a former common territory. The number of observations used in this model drops to about 10,000, i.e. by roughly 80%. Nonetheless, the coefficients retain their signs and significance. Domestic

[8] Based on AIC, one lead and one lag was selected.

and foreign GDP are still highly significant and the coefficients are close to those estimated in the full model. The dummy for Nafta remains positive and significant but is smaller compared to the previous specification, the EU is now significant and positive in this specification. In the second step of the specification, the coefficients of the time-invariant variables are somewhat smaller in absolute terms; particularly the language dummy seems to be less relevant, possibly reflecting the exclusion of former colonies in this sample. While the standard errors of this regression are generally somewhat larger, the fit of the model is even better than for the broader model suggesting that the extension of the database also introduces a significant amount of noise.

Finally, we considered adding FDI flows as an additional regressor in the robustness analysis, but we decided not to keep it in the final estimation due to a number of caveats. First, FDI data are very volatile, which considerably complicates estimation. Second, the endogeneity issue is particularly acute for FDI flows. As noted in section 2, Germany invested a lot in CEECs, consistent with its high weight in the total trade of these countries. However, it is not clear whether FDI is driving trade or the reverse, while FDI is at the same time considered as a substitute for trade (see Markusen and Venables, 1998, and Egert and Pfaffermayr, 2004). Tentative results indicate that FDI enters the regression significantly and with a positive sign, but a low coefficient. Clearly, more research on this issue is needed before a better picture can be reached.

Interpretation of predicted values

The trade values computed in equation (3) represent the prediction of the model, based on the right-hand side variables and fixed (country-pair) effects. As the left-hand side variable was expressed as the log of trade flows, it is convenient to unlog (i.e. take the exponential of) the predicted and actual values and consider their ratio. The ratio of the predicted values divided by the actual values is an indication of the goodness of fit of the model. Yet, the evolution of this ratio also provides some information on the trade potential of the particular country considered. This should not be interpreted as a forecast, however. First, the model is not set up for forecasting purposes (some of the variables being endogenous), and second, the predicted values are conditional on the values of the right-hand side variables taken at a certain time as well as the time-effects. Above all, another complication arises due to the difficulty to interpret the fixed effects (the following section will return to this issue). Therefore, one should not read too much in the actual *level* of the comparison ratio, but focus rather on its *evolution over time*.

As this paper is concerned with the integration of CEECs and Balkan countries, we reported in Chart 8, 9 and 10 the value of the predicted to actual trade flows of the three largest euro area countries to selected partners (see Chart Appendix). In more detail, we chose to first report the trade ratios of France, Germany and Italy with three groups of countries: (1) with other large industrialised countries (for comparison purposes), (2) with the largest CEECs and (3) with the

Balkan countries. The results are as follows. First, the bilateral trade relationships of France, Germany and Italy with the other large industrialised countries are close to the model predictions, the ratios being most of the time close to one. This may suggest that the model does a relatively good job in explaining trade flows for the advanced economies. Second, for most of the CEECs, the ratio's are downward sloping: they decrease from values around 1.5 or 2 (sometimes above) in the early 1990s to values close to or below 1. This pattern is common to all three large euro area countries, but tends to be more pronounced in the case of France than in the case of Germany, and less so in the case of Italy. The high values of the ratio observed in the early 1990s could suggest that at the time, CEECs were trading below potential with Germany, France and Italy. The subsequent decline in the ratio could indicate that this gap might have decreased over time.[9] In the case of the Balkan countries, we observe very different patterns. Bosnia seems to fluctuate without a clear trend in recent years vis-à-vis all three large euro area countries, while Albania and Macedonia actually have increasing ratios, suggesting that these countries' trade developed less dynamically than the fundamentals would have suggested.

Extracting information from country-heterogeneity

Moreover, the country-specific effects estimated in this model still include valuable information for analysing integration of these countries into the world economy. Following broadly Anderson and van Wincoop's (2003) interpretation of fixed effects as multilateral resistance terms, we propose a measure of trade integration which is derived from country-specific effects after controlling for the levels of the time-invariant variables. Overall, a high fixed effect for a country pair corresponds to high bilateral trade openness, while a low fixed effect indicates a relatively close economy. Accordingly, aggregating the country-specific effects for a country over all partner countries provides an indication of the country's overall degree of integration into the world economy. More formally, from equation (2), the residuals denoted by $\hat{\tilde{\alpha}}_{ij}$ are aggregated for a country *h* into a simple "trade condition indicator", tci_h:

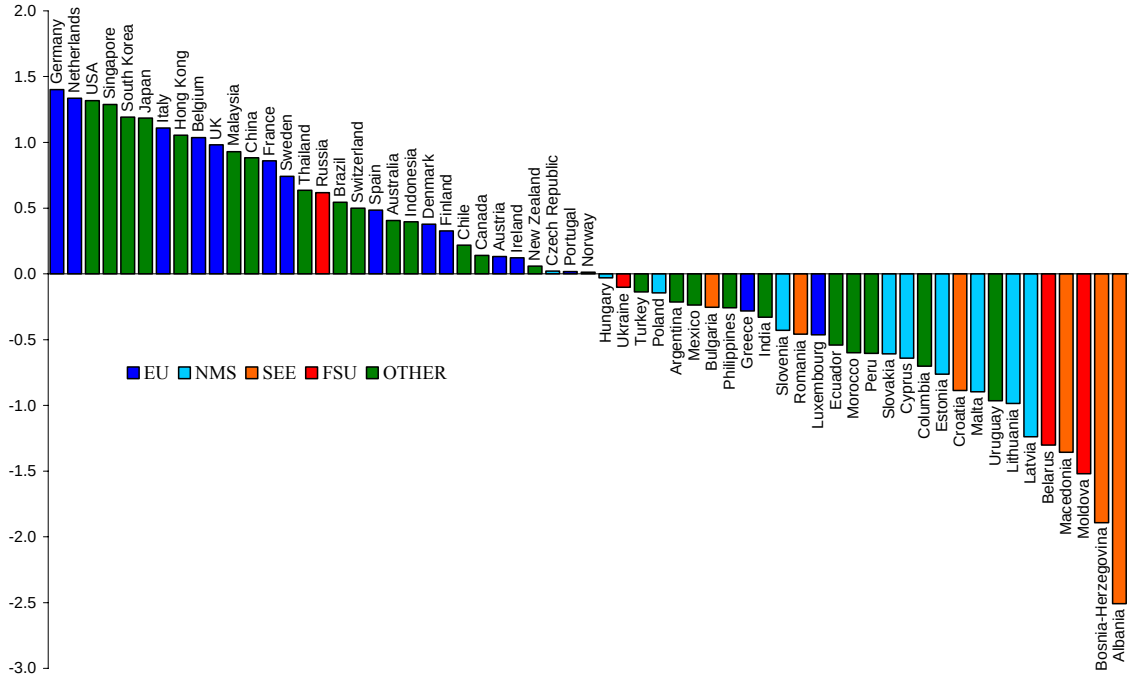
$$tci_h = \frac{1}{2(N-1)}\left(\sum_{i=1}^{N-1}\hat{\tilde{\alpha}}_{ih} + \sum_{j=1}^{N-1}\hat{\tilde{\alpha}}_{hj}\right) \tag{3}$$

Chart 5 ranks the trade condition indicator for all countries in descending order. This shows the average degree of trade integration as measured by country-specific effects for all country pairs, revealing several interesting insights for the CEECs and the Balkan countries. Firstly, there remains a significant degree of heterogeneity as signified by the variance of the indicators. Secondly, the industrialised countries tend to display an above-average trade openness. For example, Germany and the USA trade four times more than an average country in our sample after controlling for the relevant fundamentals. Exceptions are Luxembourg and Greece which

[9] Unfortunately, one can not assess exactly how far from "potential" these countries currently are as the fixed effects for the CEECs are affected by the transition process during the 1990s. Therefore, the methodology we are using allows us to analyse with precision only the evolution of the ratio over time.

appear to face a somewhat higher level of overall trade resistance which in the case of Luxembourg may be due to the specific structure of the economy. Thirdly, among emerging market economies mainly south-east Asian countries show a high accumulated fixed effect and, thus, little average trade resistance. For instance, Singapore and South Korea trade about 3.5 times above the average. Fourthly, the new Member States are mostly found in the right-hand side spectrum of the chart. Only the Czech Republic, Hungary and Poland show trade openness which is fairly close to the sample average, while Slovenia trades 40% less than an average country, the Slovak Republic, Cyprus and Estonia about 50% below the average, and Lithuania and Latvia about 70% below the average. Finally, to the far right hand side of the spectrum are the Balkan countries; Bosnia-Herzegovina and Albania reach only 15% and 8% of the average trade level, respectively, suggesting that these countries still have a significant potential to integrate more into the world economy.[10]

Chart 5: Trade Conditions (Average Fixed Effects) by Countries, Integration in World Markets



While this analysis provided some assessment about the depth of the integration of the new EU Member States in CEE and the Balkan countries into the global economy, it would also be interesting to know whether there are countries which show a particularly high or low degree of integration with these countries to identify which trade relationships should deepen disproportionately. This can be assessed by using the same indicator only for trade with the new

[10] As these economies were in a transition process in the estimation period, it cannot be ruled out that the intercept terms for these countries, which are estimated over a longer time span have a downward bias suggesting a cautious interpretation of the magnitudes discussed. Nevertheless, our sensitivity analysis including the estimation of repeated regressions during the 1990s confirmed the overall robustness of gravity models (including the effects of country dummies). For a similar discussion of the effect of the transition process on the estimation of equilibrium exchange rates for these countries, see Maeso-Fernandez et al. (2004).

Member States in CEE and with the Balkan countries. These measures are again ranked for both country groups in descending order in Charts 6 and 7.

Chart 6: Trade Conditions (Average Fixed Effects) by Countries, Integration of the CEECs

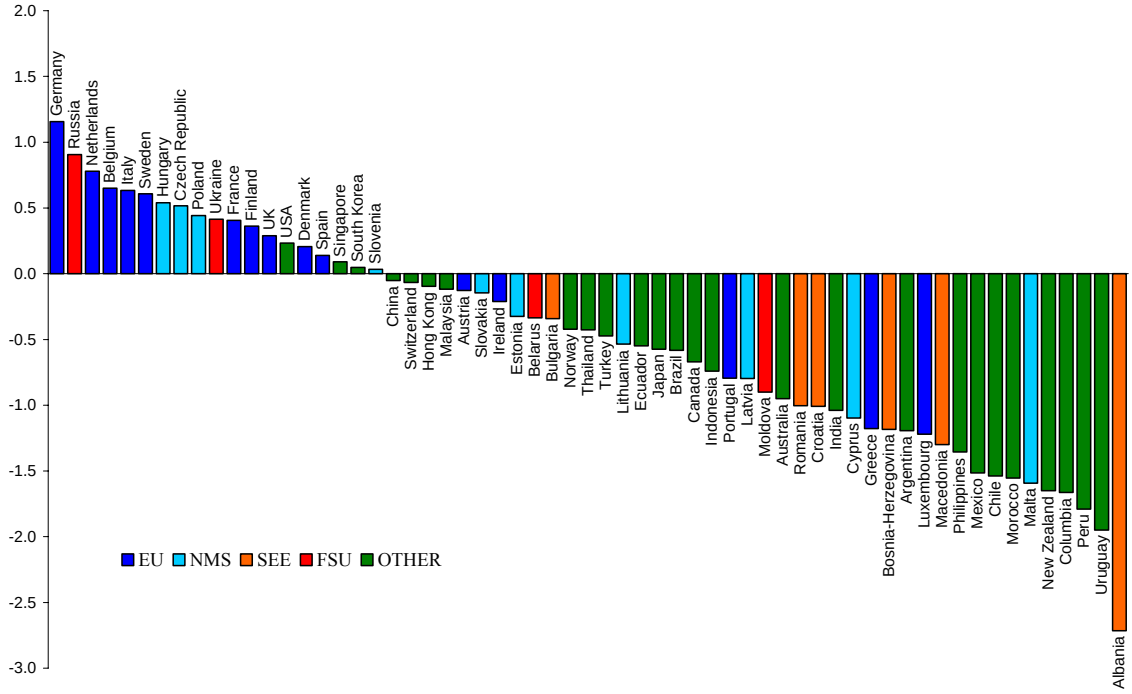
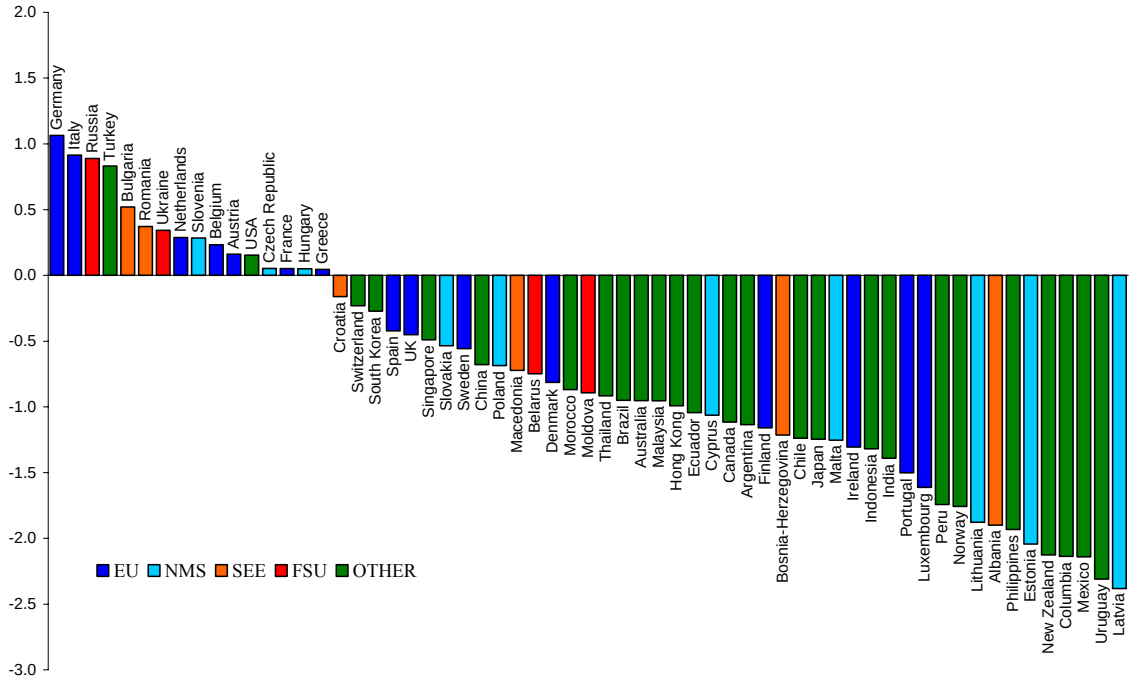


Chart 7: Trade Conditions (Average Fixed Effects) by Countries, Integration of the Balkan countries



The trade orientation indicators are above the sample average only with very few countries, thereby broadly confirming the above result that both regions do still have significant potentials to integrate into the world economy. However, it also shows that these countries are already fairly

well integrated with main countries of the European Union such as Germany, Italy, France and the Netherlands. The CEECs are also fairly well integrated with the United States and some countries of the former Soviet Union. The latter is likely to reflect historical ties which are not sufficiently captured by the dummy variables included. The new Member States show also a fairly high level of the regional trade integration, especially with respect to the core former Cefta countries (Czech Republic, Hungary and Poland). In turn, trade orientation of Balkan countries to their regional neighbours is rather low, although it is higher than in the sample average. Most importantly, there seems to be significant scope for increasing CEEC's trade with the smaller OECD countries (including several EU countries) and many emerging markets.

5. Conclusions

This paper analysed the rapid trade integration that took place in the past decade between the Central and Eastern European countries and the euro area. Estimations from a gravity model augmented with a set of additional variables shows that this rapid integration is not necessarily out of tune with fundamentals. Due to their geographical proximity with the euro area and their rising GDP levels, the natural evolution of these countries is to exchange a certain fraction of their goods with the euro area, implying an increase in their market shares in the euro area. Although results are subject to a number of caveats related to the econometric methodology, current estimations suggest that trade of CEECs and Balkan countries was artificially low in the early 1990s and that this gap gradually narrowed since then. For the large CEECs, this gap has levelled off in the recent years, suggesting that the pace of trade integration of these countries with euro area countries may slow down in the coming years.

Thus, both the stylized facts and the estimation results show that the CEECs have succeeded in trade reorientation towards the main countries in the world economy. This was only partly accomplished by a reorientation from the former Eastern European markets as we find that Russia, Ukraine and some CEECs are still important trading partners in the region (given the economic size of these countries). However, the CEECs trade too little with smaller or more distant countries both in Europe and in the world economy. Finally, the Balkan countries demonstate a small degree of trade integration with the euro area and the world economy reflecting the overall closeness of their economies.

Abstracting from those findings on the degree of trade integration, the paper also highlights some methodological issues. In particular, we document significant heterogeneity of the trade intensity across countries, translating into a significant bias in standard OLS estimations. The results suggest that most industrialised countries – after controlling for fundamentals such as distance and size – are more open than many emerging markets, particularly in Latin America. We also touch upon the issue of non-stationary variables in this context, which seems to have only modest implications in the present case as suggested by the robustness of DOLS estimates. Nonetheless, this may provide a possible direction of future research on this topic.

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Appendix
Tables

Table 2A: investment, USD billions (sum 1995-2001).

investment in:	POL	HUN	CZE	SLK	SLV	BUL	ROM	RUS	FR	DE	IT
by											
FR	9631	1483	2060	168	317	181	1038	715	-	53130	14727
DE	10000	5973	5207	1748	179	252	575	1727	29096	-	9087
IT	1469	258	107	72	74	355	219	103	7231	3323	-
UK	1151	412	603	26	21	47	49	955	21049	191840	-10667
US	1051	1116	146	36	30	18	80	328	17608	22180	3744
JP	266	500	244	0	0	0	40	70	6204	3831	616
Total received:	41743	5835	22721	2097	NA	NA	NA	NA	233271	330856	48929

Source: OECD.

Table 2A (continued)

investment in:	BEL	NETH	SP	UK	US	JP	CHN	EA	EU	Pre-ins	World
by											
FR	88482	33520	8815	89970	96137	8498	1526	204431	300235	95804	493674
DE	25346	-22591	9718	67154	168749	6672	5256	75924	155349	79425	406249
IT	14369	9029	1918	10731	5849	478	372	39998	51408	11409	67706
UK	6408	49270	18357	-	270795	11849	1937	304132	309263	5130	660510
US	18204	66415	3704	95537	-	13619	5177	149486	243383	93897	462161
JP	2577	25694	1320	56017	117989	-	13485	43270	100200	56930	303541
Total received:	466571	196969	102908	370307	363027	82510	NA				

Source: OECD.

Table 2B: investment, % of FDI outflows (sum 1995-2001).

investment in:	POL	HUN	CZE	SLK	SLV	BUL	ROM	RUS	FR	DE	IT
by											
FR	2.0	0.3	0.4	0.0	0.1	0.0	0.2	0.1	-	10.8	3.0
DE	2.5	1.5	1.3	0.4	0.0	0.1	0.1	0.4	7.2	-	2.2
IT	2.2	0.4	0.2	0.1	0.1	0.5	0.3	0.2	10.7	4.9	-
UK	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.1	3.2	29.0	-1.6
US	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.1	3.8	4.8	0.8
JP	0.1	0.2	0.1	0.0	0.0	0.0	0.0	0.0	2.0	1.3	0.2

Source: OECD.

Table 2B (continued)

investment in:	BEL	NETH	SP	UK	US	JP	CHN	EA	EU	Pre-ins	World
by											
FR	17.9	6.8	1.8	18.2	19.5	1.7	0.3	41.4	60.8	19.4	100.0
DE	6.2	-5.6	2.4	16.5	41.5	1.6	1.3	18.7	38.2	19.6	100.0
IT	21.2	13.3	2.8	15.8	8.6	0.7	0.5	59.1	75.9	16.9	100.0
UK	1.0	7.5	2.8	-	41.0	1.8	0.3	46.0	46.8	0.8	100.0
US	3.9	14.4	0.8	20.7	-	2.9	1.1	32.3	52.7	20.3	100.0
JP	0.8	8.5	0.4	18.5	38.9	-	4.4	14.3	33.0	18.8	100.0

Source: OECD.

Table 3: Export Market Shares, CEECs.
Percentage of total exports and imports by destination

	E. A.; o. w.	DE	FR	IT	USA	UK	Russia	New EU MS; o.w.	CY	CZ	ES	HU	LV	LI	MA	PO	SK	SV
New EU MS	55.4	28.1	5.2	6.4	3.0	4.1	5.5	11.9	0.1	3.4	0.3	1.6	0.5	0.7	0.0	2.4	2.4	0.5
CY	28.7	5.2	8.0	3.2	2.5	15.1	18.5	5.3	0.0	0.7	0.1	0.1	0.0	1.7	0.1	2.3	0.2	0.1
CZ	58.9	34.9	4.8	4.9	2.8	4.1	2.9	14.3	0.0	0.0	0.1	2.2	0.1	0.3	0.0	4.5	6.6	0.6
ES	40.4	9.9	2.2	1.9	2.5	4.7	11.4	11.9	0.2	0.7	0.0	0.8	4.9	3.3	0.2	1.5	0.1	0.1
HU	59.5	29.5	4.6	5.9	4.1	3.6	3.8	7.3	0.0	2.5	0.1	0.0	0.1	0.1	0.0	2.2	1.6	0.7
LV	33.3	14.3	2.4	3.6	6.2	12.2	10.2	16.7	0.1	0.9	4.9	0.4	0.0	7.3	0.0	2.6	0.4	0.1
LI	35.9	14.8	5.2	4.1	3.5	5.0	14.9	16.0	1.1	1.4	2.5	0.6	5.9	0.0	0.0	4.1	0.2	0.2
MA	35.1	8.0	10.2	10.2	7.8	8.8	1.6	1.6	0.1	0.1	0.3	0.6	0.0	0.1	0.0	0.4	0.0	0.1
PO	57.6	30.5	6.0	7.0	1.9	4.3	5.3	10.2	0.2	4.0	0.2	2.0	0.4	1.4	0.0	0.0	1.5	0.5
SK	53.4	30.3	3.0	5.6	2.6	1.9	6.4	24.8	0.0	15.9	0.0	3.8	0.1	0.1	0.0	4.0	0.0	0.9
SV	63.5	19.8	9.2	16.3	2.3	2.0	1.8	8.2	0.0	2.4	0.0	2.2	0.1	0.2	0.0	2.1	1.2	0.0
RO	59.0	16.2	7.4	21.6	3.0	5.0	3.7	7.0	0.1	1.2	0.0	3.2	0.0	0.0	0.1	1.4	0.6	0.5
BU	50.4	13.3	5.3	13.1	3.8	2.7	5.3	4.6	0.3	1.2	0.0	1.0	0.1	0.1	0.1	1.0	0.4	0.5
TK	43.2	15.6	5.9	7.9	6.3	6.7	4.8	2.6	0.0	0.6	0.0	0.5	0.0	0.2	0.2	0.7	0.2	0.2

Notes: This table can be read in the following way. Taking the example of Hungary (HU), 59.5% of Hungary's trade is exchanged with the euro area, of which 29.5% with Germany, 4.6% in France and 5.9% for Italy. Hungary's trade with other new EU Member States reaches 7.3%, of which 2.5% with the Czech Republic, etc. The first row of the table shows the average, for each column, of the 10 new EU Member States.

Chart 8: Relative Trade Developments (Predicted/Actual Trade) in GERMANY

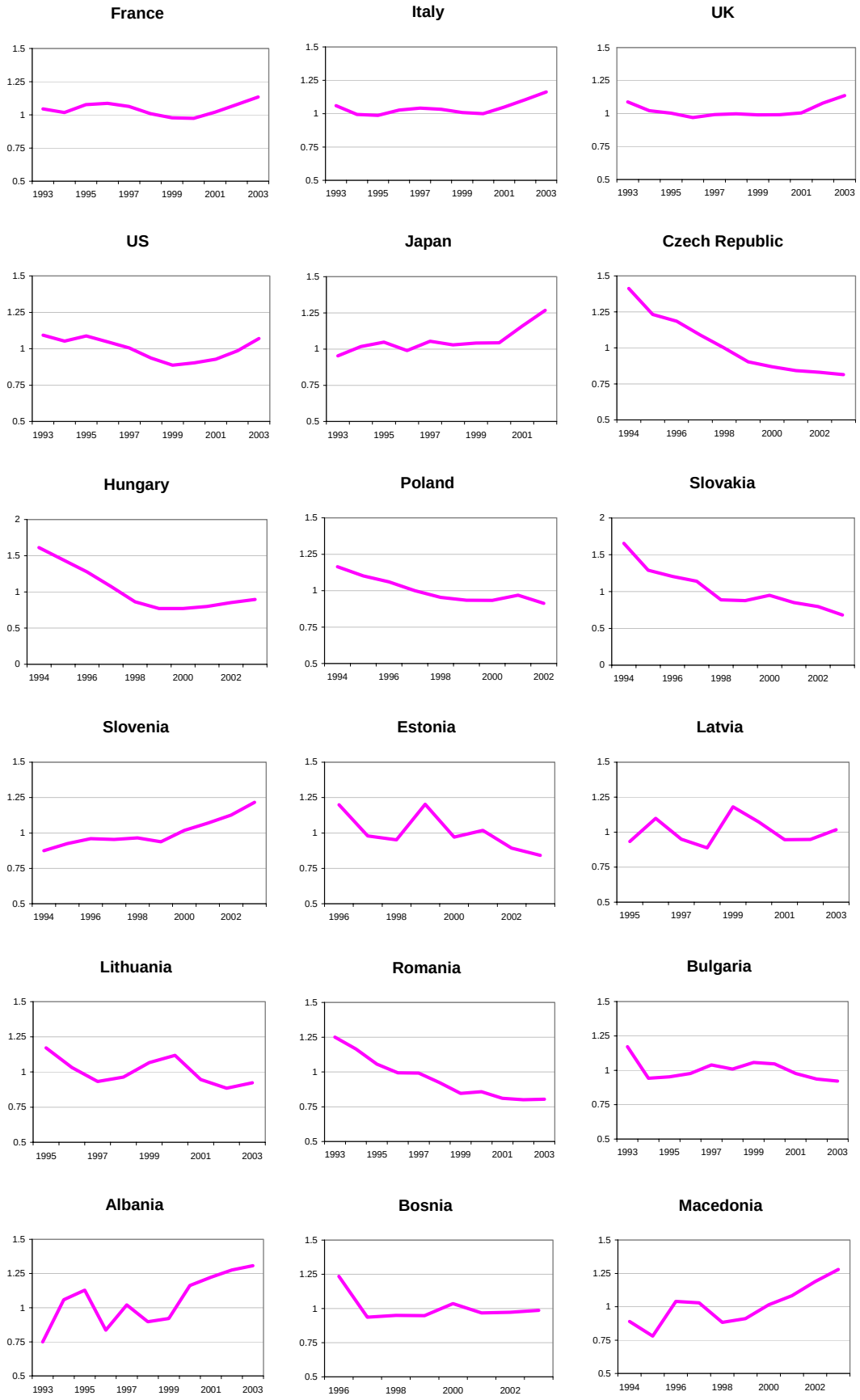

Chart 9: Relative Trade Developments (Predicted/Actual Trade) in FRANCE

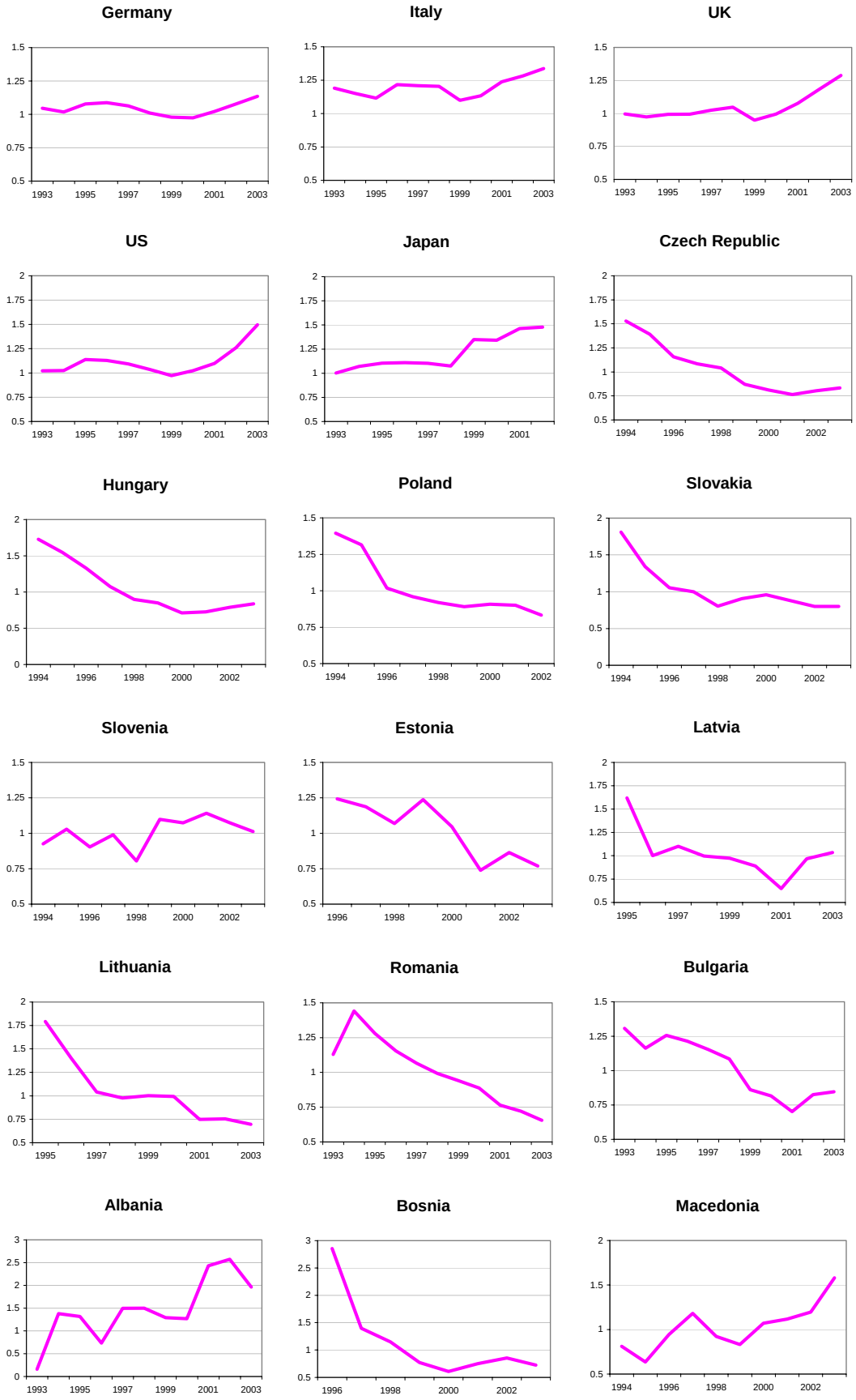

Chart 10: Relative Trade Development (Predicted/Actual Trade) in ITALY