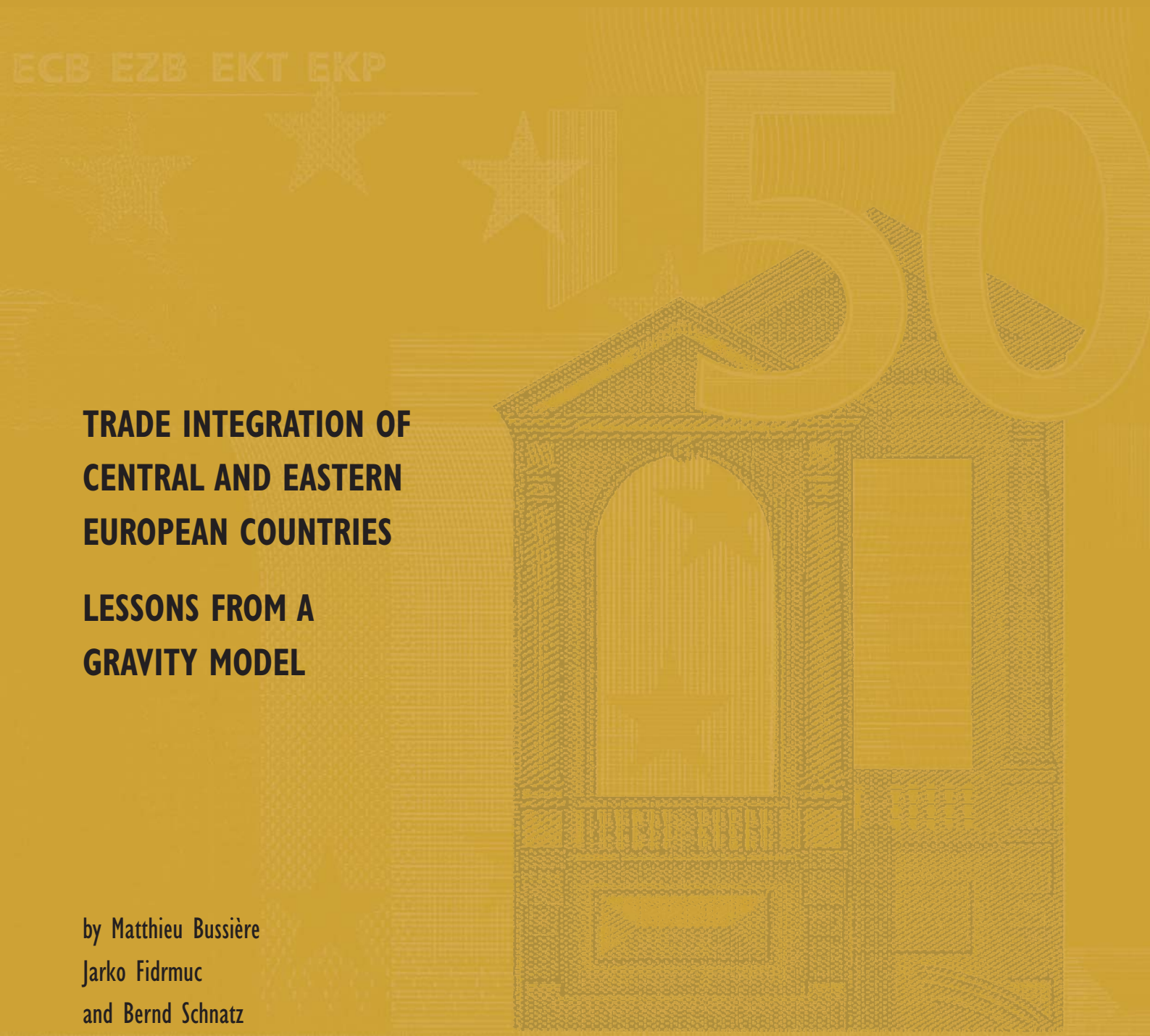
EUROPEAN CENTRAL BANK

WORKING PAPER SERIES
NO. 545 / NOVEMBER 2005



TRADE INTEGRATION OF CENTRAL AND EASTERN EUROPEAN COUNTRIES

LESSONS FROM A GRAVITY MODEL

by Matthieu Bussière
Jarko Fidrmuc
and Bernd Schnatz

EUROPEAN CENTRAL BANK

WORKING PAPER SERIES
NO. 545 / NOVEMBER 2005

TRADE INTEGRATION OF CENTRAL AND EASTERN EUROPEAN COUNTRIES

LESSONS FROM A GRAVITY MODEL [1]

by Matthieu Bussière [2],
Jarko Fidrmuc [3]
and Bernd Schnatz [4]

In 2005 all ECB publications will feature a motif taken from the €50 banknote.

1 We have benefited from comments and advice by Mike Artis, Anindya Banerjee, Gunter Deuber, Mardi Dungey, Peter Egger, Carolyn Evans, Robert Holzmann, Stelios Makrydakis, Peter Mooslechner, Doris Ritzberger-Grünwald, Eduard Hochreiter, and by an anonymous referee. We are thankful to participants at the Conference on European Economic Integration in Vienna, November 28-30, 2004, at the 80th Annual Conference of the Western Economic Association in San Francisco, July 4-8, 2005, at the Annual Congress of the Verein für Socialpolitik in Bonn, 27-30 September 2005, and at the European Central Bank for their helpful comments. 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.

2 European Central Bank, Kaiserstrasse 29, D-60311 Frankfurt am Main, Germany; e-mail: matthieu.bussiere@ecb.int

3 Oesterreichische Nationalbank, University of Munich and Comenius University Bratislava; e-mail: jarko.fidrmuc@lrz.uni-muenchen.de

4 European Central Bank, Kaiserstrasse 29, D-60311 Frankfurt am Main, Germany, e-mail: bernd.schnatz@ecb.int

Address
Kaiserstrasse 29
60311 Frankfurt am Main, Germany

Postal address
Postfach 16 03 19
60066 Frankfurt am Main, Germany

Telephone
+49 69 1344 0

Internet
http://www.ecb.int

Fax
+49 69 1344 6000

Telex
411 144 ecb d

ISSN 1561-0810 (print)
ISSN 1725-2806 (online)

CONTENTS

Abstract

This paper analyses the rapid trade integration of the Central and Eastern European countries (CEECs) with the euro area in the past ten years and draws implications for further integration. We use as benchmark an enhanced gravity model estimated for a large sample of bilateral trade flows across 61 countries since 1980. We show that a careful examination of the model's fixed effects is crucial for the proper interpretation of the results: simply extracting the predicted values of the regression ("in-sample") – as commonly done in the literature – leads to distorted results as it fails to properly account for the transition process. We therefore propose a two-stage "out-of-sample" approach. The results suggest that trade integration between most of the largest CEECs and the euro area is already relatively well advanced, while some Baltic and South Eastern European countries still have significant scope for trade integration.

JEL classification: C23, F15, F14.

Keywords: Gravity Model, Panel Data, Central and Eastern European Countries, Free Trade Agreement, Transition Economies.

Non-technical summary

The transition economies of Central and Eastern Europe have experienced since the early 1990s very quick trade integration into world markets, particularly with the more mature economies of Western Europe. Taken as an aggregate, they now represent the euro area's third largest trading partner. The objective of this paper is to better understand the factors behind this process and to gauge the potential for further integration, using as benchmark results from an enhanced gravity model. The proposed contribution of the paper is therefore twofold: first, to guide the policy debate with a benchmark of "normal" trade links based on an enhanced gravity model, and second to discuss and refine the existing approach to the estimation of gravity models.

From a policy perspective, the aim of the paper is to contribute to the policy debate on trade integration by providing a quantifiable, model-based benchmark of bilateral trade links. Clearly, the fact that trade flows between the transition economies of Central and Eastern Europe and the euro area have proved very dynamic should not, per se, come as a surprise. The geographical proximity of these countries with the euro area, their robust economic growth rates, as well as the large economic weight of the euro area are likely factors that can account for this development. However, to assess the intensity of these trade linkages, it is useful to derive a quantifiable benchmark of what would constitute "normal" trade relationships, based on a set of economic fundamentals. In spite of their simplicity, gravity models constitute a convenient, tractable tool that can be used to compute such estimates, owing in particular to their high explanatory power and building on recent developments in panel data econometrics. Of course, such estimates, like any model-based results, should not be given a normative interpretation, as idiosyncratic factors may play a role as well; rather, the intended role of the model is to give some structure to the policy discussion.

From an academic perspective, the aim of this paper is to discuss and refine existing approaches to the estimation of gravity models. In terms of explanatory variables, we start from a simple gravity model relating trade flows to distance and economic size, to which we add five other variables accounting for a common language, a common border, countries that used to be part of the same territory, participation in a free trade agreement, and possible valuation effects. These additional variables allow discussing a wide range of issues related to the transition process. Further, the paper also makes a methodological contribution to the standard estimation of gravity models in a panel framework. Consistent with recent research, it applies a fixed (country-pair specific) effect model to account for unobservable factors, but it also discusses the implication of using fixed effects in the particular case of transition economies. Indeed, the analysis suggests that transition-related factors, which are difficult to measure, may have driven a wedge between actual and predicted values of trade between these countries, especially in the early stage of the transition process. We show that a careful examination of the fixed effects of the model is crucial for the proper interpretation of the results. In particular, simply extracting the predicted values from the regression ("in-sample" approach) – as commonly done in the literature – is likely to

lead to distorted results. As an alternative, we propose a two-stage "out-of-sample" approach, where the model parameters are estimated with a subsample composed of OECD countries only, and the potential value of trade flows of the transition economies computed using the corresponding data for these countries on the right-hand side.

We use a database of bilateral trade flows across 61 countries over the period 1980-2003. Thus, estimations are performed with more than 50,000 observations, which is more than in most studies on the subject. This has two main advantages: first it yields tightly estimated coefficients and second, it includes other dynamically developing countries which were at some point in the past at a similar stage of economic development as the Central and Eastern European countries are presently. 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 (around two thirds). The model also successfully passes several robustness tests, including the use of alternative panel estimators and the introduction of additional variables to test for a possible omitted variable bias.

Two sets of results are presented. Firstly, we extract information from the estimated country-heterogeneity and discuss the interpretation of average fixed effects for the countries in the sample. This first set of results suggests that industrialised countries are, on average, more integrated in world markets than emerging markets. Particularly, the Central and Eastern European countries still have scope to integrate into the world economy, particularly with more distant industrialised countries and emerging economies. By contrast, the degree of integration of these countries with the countries of the former Soviet Union is relatively high, compared to the benchmark. Secondly, we derive the "trade potential" of these countries on the basis of the two-stage out-of-sample approach. The trade potential is used as a benchmark and compared to the actual evolution of trade levels (which does not preclude that trade between these countries and the euro area may grow over a protracted period above "potential"). This second set of results suggests that trade integration between most of the largest Central and Eastern European countries and the euro area is already relatively well advanced, given that the wedge between actual and potential trade has been significantly reduced. Meanwhile, the Baltic countries as well as the South Eastern European countries still have significant scope to strengthen their trade links with the euro area.

1. Introduction

Over the past ten years, Central and South Eastern European (CSEE)[1] countries experienced 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[2] has almost doubled between 1993 and 2003.[3] Taken as an aggregate, the CSEE countries now represent the euro area's third largest trading partner behind the United Kingdom and the United States. Second, from the perspective of these countries, the euro area represents the most important trading partner.

The natural question that arises from these stylised facts is whether the increasing integration of the CSEE countries with the euro area is likely to continue, or rather to slow down in the coming years. Of course, the fact that trade integration between CSEE 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 geographical proximity of these countries with the euro area, their robust economic growth rates, as well as the large economic weight of the euro area are likely factors that can account for this development. In addition, the transition process itself – combined with the removal of trade hurdles and accession to the European Union – most certainly further enhanced trade between these two groups of countries. However, assessing the degree of trade integration requires having a view on what would constitute "normal" trade relationships for these countries with the euro area.

The intended contribution of this paper is therefore to provide estimates of benchmark trade relationships for CSEE transition economies, using results from an enhanced gravity model. For that purpose, it employs as starting point a standard gravity model, where bilateral trade flows between countries are modelled as a function of their economic size and of the geographical distance between them. While being simple, this framework constitutes a convenient, tractable tool, due in particular to the high explanatory power of gravity models and building on recent developments in panel data econometrics. The standard model is enriched by adding five other variables to account for (i) a common language, (ii) a common border, (iii) countries that used to be part of the same territory, (iv) participation in a free trade agreement, and (v) valuation effects. The paper also examines the role of foreign direct investment (FDI) flows but does not explore this topic is detail due to data limitations. Overall, these additional variables allow discussing a wide range of issues related to the transition process.

Further, the paper also makes a methodological contribution by critically discussing the existing application of gravity models, as generally recommended by recent research (e.g. Egger and

[1] The paper focuses on Central and Eastern European (CEE) and South Eastern European (SEE) countries; we refer to the aggregate of these two groups as Central and South Eastern European Countries (CSEE). The country list and the definition of the regional groupings are presented in the data Appendix.

[2] 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).

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

Pfaffermayr, 2003), to the particular case of transition economies. Our results suggest that transition-related factors may have driven a wedge between actual and predicted values for these countries, especially in the early stage of the transition process. These factors are, however, difficult to measure as they may include the low quality of transport infrastructures to trade goods, the lack of expertise of foreign firms to do business in these countries, as well as institutional uncertainties surrounding the transition process. Intuitively, these elements suggest that trade flows to and from these countries were significantly lower than the standard gravity forces would imply, particularly at the early stage of the transition process. We show that a careful examination of the fixed effects of the model is crucial for the proper interpretation of the results. In particular, simply extracting the predicted values from the regression ("in-sample" approach) – as commonly done in the literature – leads to distorted results. As an alternative, we propose a two-stage "out-of-sample" approach, where the model parameters are estimated with a subsample composed of OECD countries only, and the potential value of trade flows of the transition economies computed using the corresponding data for these countries on the right-hand side. Of course, the trade potential is used as a broad benchmark and possible deviations to the actual evolution of trade levels are discussed, implying that our estimates should not be given a normative interpretation.

The model is estimated with 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 includes other dynamically developing countries which were at some point in the past at a similar stage of economic development as the CSEE countries are presently. 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 (around two thirds). The model also successfully passes several robustness tests, including the use of alternative panel estimators and the introduction of additional variables to test for a possible omitted variable bias.

Two sets of results are presented. Firstly, we extract information from the estimated country-heterogeneity and discuss the interpretation of average fixed effects for the countries in the sample. This first set of results suggests that industrialised countries are, on average, more integrated in world markets than emerging markets. Particularly, the CSEE countries still have scope to integrate into the world economy, particularly with more distant industrialised countries and emerging economies. By contrast, the degree of integration among the CSEE countries and of these countries with the countries of the former Soviet Union is relatively high, compared to the benchmark. Secondly, we derive the "trade potential" of these countries on the basis of the two-stage out-of-sample approach. The trade potential is used as a benchmark and compared to the actual evolution of trade levels (which does not preclude that trade between these countries and the euro area may grow over a protracted period above "potential"). This second set of results suggests that trade integration between the largest CEE countries and the euro area is already

relatively well advanced, as the wedge between actual and potential trade has been significantly reduced. This would imply that the adverse institutional factors mentioned earlier have been losing some importance. Meanwhile, the Baltic countries as well as the SEE countries still have significant scope to strengthen their trade links with the euro area.

The rest of the paper is organised as follows. Section 2 presents some stylised facts on international trade developments from the perspective of both the CSEE countries and the euro area. Section 3 reviews the existing literature on gravity models (with a particular emphasis on transition economies) and discusses a set of methodological issues. Section 4 reports the estimation results. Section 5 provides an interpretation of the results by extracting information on country heterogeneity and discusses the derivation of "normal" trade levels. Section 6 concludes.

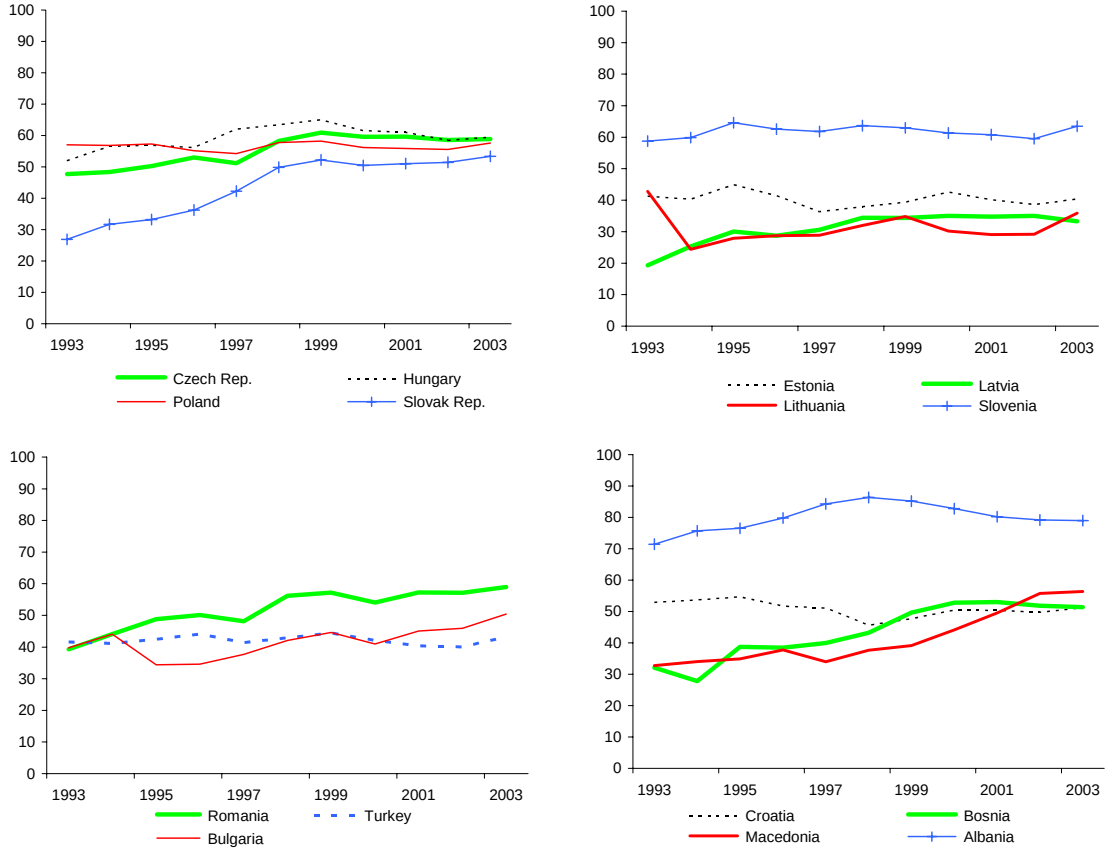
2. Euro area trade with CSEE countries: stylised facts

2.1 The CSEE countries' perspective

For the Central and Eastern European (CEE) countries, 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).

Chart 1: The importance of the euro area for CEE countries

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



In the case of Slovakia, 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 broadly stable over 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 similar 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%.

The large share of euro area trade in the new EU Member States reflects predominantly the high weight of Germany (see Table 3 in the Appendix).[4] Moreover, trade among the new EU Member States is still large, particularly for the Czech Republic and Slovakia, which may be partially due to their common history. Also, the share of Russia in the CEE countries remains high (5% on average, which is higher than that of the UK or 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 South Eastern European (SEE) 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. 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.

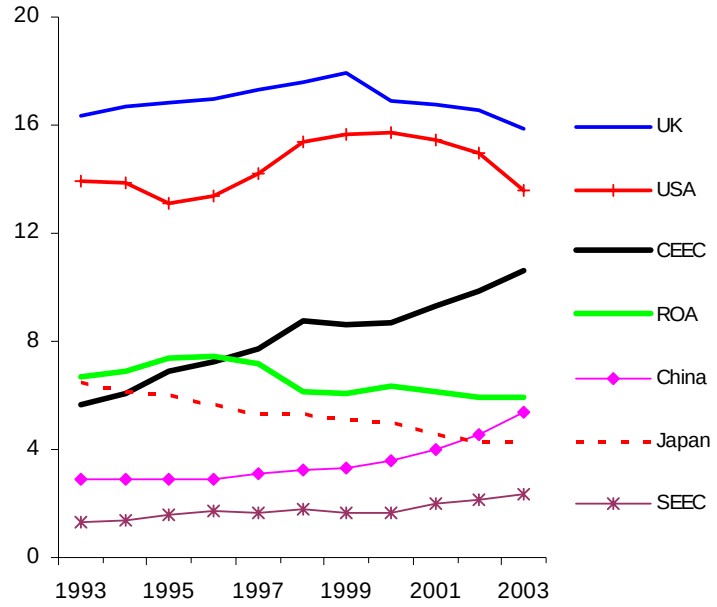
[4] For instance, Germany accounts on average for more than 28% of total trade of the new EU Member States, against 5.2% for France and 6.4% for Italy.

2.2 The euro area perspective

From a euro area perspective, the increase in the market shares[5] of the Central and Eastern European countries in the past ten years (and possibly more recently with China) provided an unprecedented example of integration dynamics, while the share of Japan continuously decreased (see Chart 2). Between 1993 and 2003, the share of the CEE countries in extra-euro area trade has almost doubled, from 5.7% to 10.6%. 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



Note: Acronyms refer to Central and Eastern European Countries (CEEC), Rest of Asia (ROA) and South Eastern European Countries (SEEC), see definition of country aggregates in data Appendix.

Trade between the euro area and other candidate and accession countries (Bulgaria, Croatia, Romania, and Turkey) has also increased substantially in recent years – similarly to the experience of CEE countries 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 CEE countries did in the past decade.

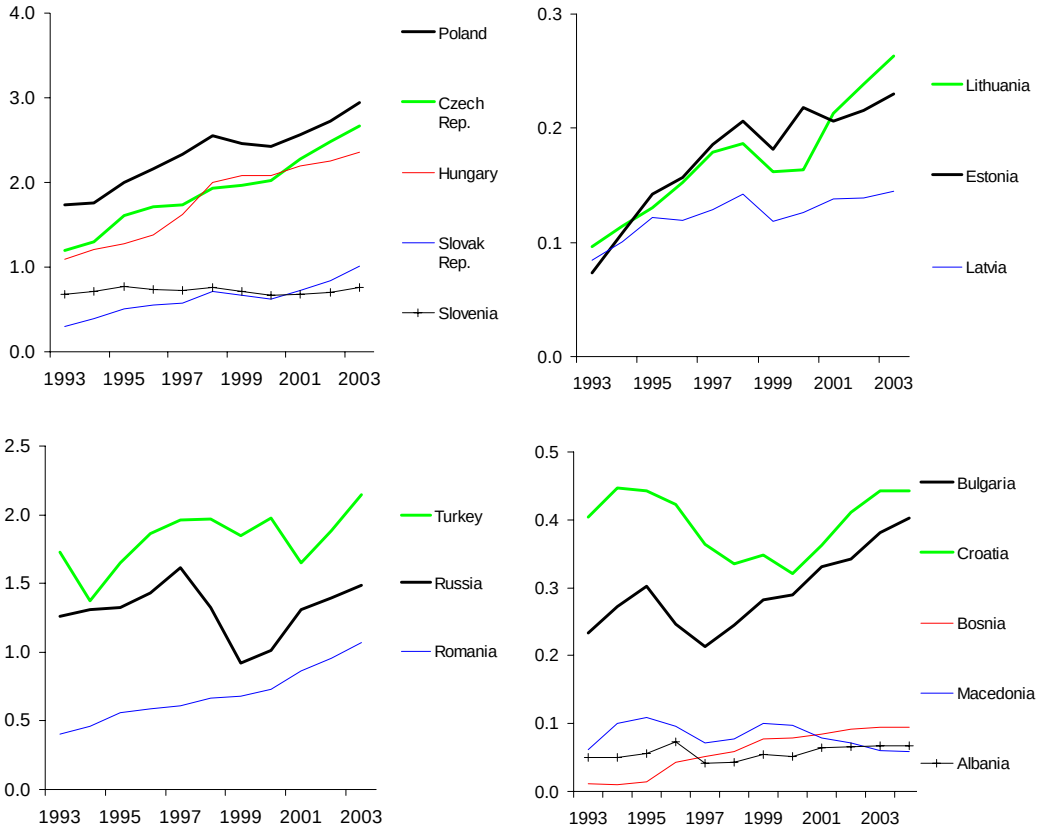
Taken together, the CSEE countries as a group, while being individually small trading partners of the euro area, are a fairly important trading partner of the euro area. In 2003, the share of the region as a whole in extra-euro area trade was equal to 13% (10.6% for the CEECs and 2.3% for the SEECs). This is almost as much as the United States (13.6%) and significantly more than Japan (4.3%), China (5.4%) or Russia (1.5%), but still significantly less than the United Kingdom

[5] The term market shares refers to the percentage of trade (imports + exports) with a particular country relative to total trade.

(15.9%). Among the CSEE countries, the market shares of Poland, the Czech Republic and Hungary in the euro area are between 2-3%, while the shares of the other CSEE countries are commonly around 1% (Chart 3). Among the SEECs, Romania accounts for the largest share (above 1%), followed by Bulgaria (0.4%).

Chart 3: Shares of CEE countries in euro area trade

Percentage of total extra-euro area trade



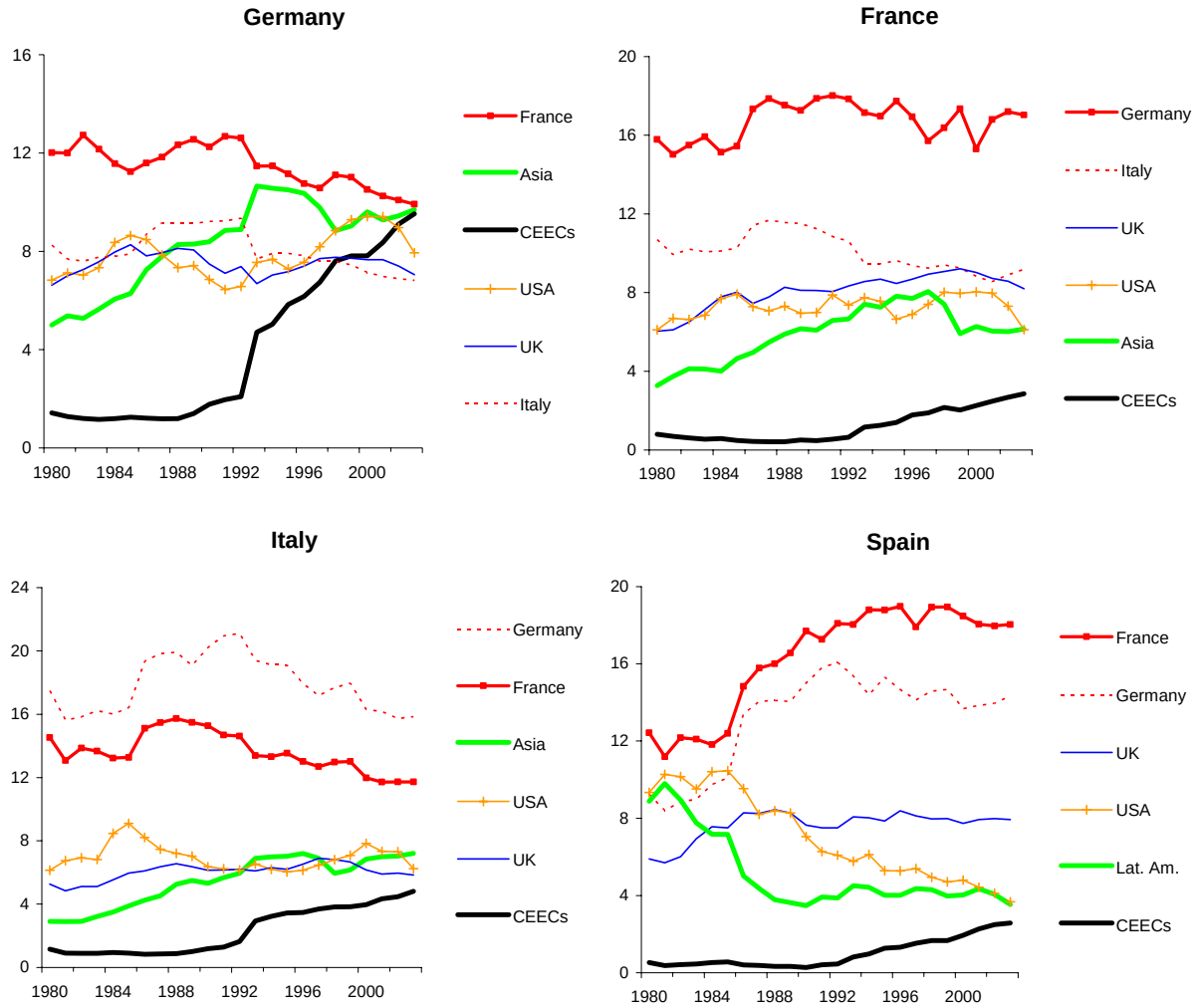
Note: scale may differ across charts to enhance readability.

Looking at developments in individual euro area countries (Chart 4), trade with the CEE countries rose particularly strongly for Germany, where the share of these countries together is now the highest (the share of these countries taken as an aggregate is already comparable with the share of France and higher than that of the United States or the United Kingdom). By contrast, the share of the CEE countries 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 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.

Finally, it is worth mentioning the role of FDI for the CEE countries. According to OECD data, Germany invested much more than any other country in CEE countries between 1995 and 2001, both in absolute value and in percentage of total FDI outflows (see Table 2 in the appendix). However, there are a few exceptions: France invested nearly as much as Germany in Poland, Italy

was the largest investor in Bulgaria, and France invested more in Romania than Italy and Germany together. By contrast, investment from the other large industrialised countries (UK, USA and Japan) in CSEE countries was rather low. Both the UK and Japan invested a sizeable fraction of their total FDI in the USA (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 CEE countries trade.

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



Note: scale may differ across charts to enhance readability.

Taken together, the stylized facts on trade between the euro area and the CSEE countries show significant adjustments over the past decade (see Djankov and Hoekman, 1997). These countries 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 has reached 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

3.1. A selective literature review

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, these 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. Accordingly, in their most general form these models 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); they are consistent with standard models of international trade (see Deardorff, 1995, and Anderson, 1979, Anderson and van Wincoop, 2003).

As regards other factors, four variables are commonly added (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. A common language dummy could for instance explain the relatively high levels of Spain's trade with its former colonies in Latin America. Secondly, if two countries were part of the same territory (such as the countries of former Yugoslavia or the former Soviet Union), 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. Finally, the accession to a free trade arrangement may stimulate trade among the constituent countries, as the rise of Spanish trade with other euro area countries in the second half of the 1980s indicates (see Chart 4).

In view of their simplicity and high explanatory power, gravity models have been applied to the particular case of CEE 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 CEE countries with developed countries has been only a fraction of potential trade. Baldwin (1994) suggested that actual trade with the EU12 was up to 5 times smaller than potential trade for Bulgaria and former Czechoslovakia in 1989. Some CEE 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 in non-EU countries which have a trade agreement with the EU (so-called associated countries). Egger (2003) and Fidrmuc and Fidrmuc (2003) found that trade between the EU15 and the CEE countries was close to the predicted level at the end of the 1990s.

Meanwhile, Fontagné et al. (1999) found that trade potentials were largely exhausted by the end of the decade (in the longer-run however, trade flows could increase in larger proportions once all structural adjustment is completed).

The literature on the SEE countries is rather scarce compared to the literature on CEE countries. To our knowledge, the only studies that analyse trade potentials for the entire South Eastern European region are Christie (2002 and 2004), suggesting significant differences of the actual trade from the potential values, both within the region and with the developed countries, mainly owing to the lack of transport infrastructure. Vujčić and Šošić (2004) present gravity estimates for Croatia. However, these studies do not fully employ 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.

Nonetheless, Christie (2002) and Vujčić and Šošić (2004) identified significant 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 World Trade Organisation. 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.[6]

3.2. 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*.[7] Many papers using the gravity approach still employ either a cross-section or a pooled OLS specification, and often ignore country heterogeneity 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 transition countries.

Failing to account for unobserved country heterogeneity can lead to distorted estimates. Serlenga and Shin (2004) as well as Cheng and Wall (2005) demonstrated that ignoring unobserved 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 fixed effects (see also Feenstra, 2002). Similarly, Mátyás (1997, 1998) extended a standard gravity model with two sets

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

7 See Egger (2004) on FTA and Rose (2000) on currency union. Exceptions from this mainstream of applied trade analysis are Cheng and Wall (2005) and Fidrmuc (2004).

of country dummies (for exporting and importing countries).[8] Subsequent research on panel estimators (see Egger and Pfaffermayr, 2003) showed, however, that instead of using one dummy variable per country, individual country pair dummies (fixed effects) should be included to get efficient estimators. These specifications, which usually include also time dummies to control for common shocks, 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) suggested 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 pair-specific effects into account, which – as emphasised by Micco et al. (2003) and Cheng and Wall (2005) – 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 two notable 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 (all variables are defined in logarithms):

$$T_{ijt} = \alpha_{ij} + \theta_t + \beta_1 y_{ijt} + \beta_2 d_{ij} + \beta_3 q_{it} + \beta_4 q_{jt} + \beta_5 \sigma_{ijt} + \sum_{k=1}^{K} \gamma_k Z_{ijkt} + \varepsilon_{ijt} \qquad (1)$$

where T_{ijt} corresponds to the size of bilateral trade between country i and country j at time t, y_{ijt} is the sum of y_{it} and y_{jt}, which stand for the (real) GDP in the country i and j, respectively, at time t, d_{ij} is the distance variable, Z_k reflects cultural, historical and political factors affecting bilateral

[8] 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. See also Fontagné et al. (2002) for a methodological discussion.

trade between two countries.[9] Consistent with the arguments made before, β_1 is expected to be positive while β_2 should be negative. As standard in the literature, trade is defined as the average of exports and imports and distance is measured in terms of great circle distances between the capitals of country i and country j.[10] 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. 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_5. As discussed above, four additional factors possibly affecting bilateral trade were considered by including dummy variables (Z) 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 (2005) 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 collinear 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 (2005) 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.

$$\hat{\alpha}_{ij} = \beta_1 + \beta_2 d_{ij} + \sum_{k=1}^{K} \gamma_k Z_k + \mu_{ij} \qquad (2)$$

[9] Following Micco et al. (2003), real GDP per capita is not included in the fixed effect estimation owing to the high collinearity between those dummies and the population.

[10] 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.

4. Data and estimation results

4.1. Data

The dataset includes annual data from 1980 to 2003. By the end of the sample period, it comprises 61 countries. 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 almost 3,500 bilateral trade relationships. Trade data are mostly compiled from the International Monetary Fund Direction of Trade Statistics (IMF DOTS); they are expressed in US dollars and deflated by US industrial producer prices. GDP data come from the IMF International Financial Statistics (IMF IFS) and are deflated by US CPI. Missing data for some SEE countries have been included from the WIIW[11] and from the EBRD[12] 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 capitals of the two countries under consideration and comes from Fidrmuc and Fidrmuc (2003) and the MS Encarta World Atlas software (for details, see data appendix).

The dummy variable for common territory includes countries which once constituted in the past 20 years 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 the 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 (see data Appendix for the composition of the free trade agreements).

4.2. Estimation results

The coefficients of all variables included in the specification (except the EU dummy) have the expected sign and are statistically significant. Overall, the relatively high goodness-of-fit suggests

[11] Wiener Institut für Internationale Wirtschaftvergleiche (Vienna Institute for International Economic Studies).
[12] European Bank for Reconstruction and Development.

that even such a fairly simple specification of international trade is able to explain a significant part of the variation in international trade (see Table 1). The first column shows the results following the fixed effects (FE-) formulation, which is suggested by Cheng and Wall (2005). 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.

Table 1: Estimation Results

	Fixed effects	Random effects	Pooled estim.	Country effects	DOLS	Fixed effects	Fixed effects	Fixed effects
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Sample:	full sample	full sample	full sample	full sample	full sample	OECD	full sample, data from 1993	full sample, regional time dummies
Size	0.562**	0.859**	0.928**	0.543**	0.548**	0.589**	0.619**	0.503**
Distance	*-0.670***	-0.859**	-0.838**	-1.149**	*-0.658***	*-0.585***	*-0.692***	*-0.709***
Territory	*-0.043*	1.274**	1.868**	2.582**	*-0.090*	--	*0.199*	*-0.074*
Border	*1.212***	0.743**	0.504**	0.218**	*1.247***	*0.879***	*1.158***	*1.218***
Language	*1.268***	1.058**	0.801**	0.568**	*1.293***	*0.259***	*1.232***	*1.160***
EU	-0.013	0.028	0.149**	-0.318**	-0.042	0.219**	-0.040	0.228**
Asean	0.450**	0.407**	2.063**	0.236**	0.420**	--	--	0.383**
Mercosur	0.243*	0.180*	0.451**	0.363**	0.210*	--	--	0.177*
Cefta	0.217**	0.223**	0.781**	0.648**	0.193**	--	0.210**	0.126*
Nafta	0.451**	0.523**	0.050	0.437**	0.444**	0.201**	0.352	0.464*
RER1	0.034**	0.074**	-0.022*	0.022*	0.082**	0.209**	0.001	0.026**
RER2	0.058**	0.099**	0.004	0.049**	0.045**	0.281**	0.127**	0.050*
First step:								
R^2	0.64	0.82	0.81	0.89	0.64	0.68	0.64	0.63
N	51863	51863	52614	51863	43305	10047	33183	51863
Second step:								
R^2	0.33				0.32	0.63	0.37	0.33
N	3414				3305	459	3414	3414

** *= Significant at the 1% level,* * *= Significant at the 5% level.*
FE = fixed effects, RE = random effects, DOLS = dynamic OLS. Figures in italics have been estimated in the second step. Coefficients for time dummies in the first step estimations are not reported.

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

The FE-model confirms that economic size has 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 0.56%. 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.[13] As the low impact of the EU dummy in the estimation raises a number of methodological and policy questions, we will specifically return to it at the end of the section.

While the overall R-squared of the FE-regression amounts to 0.63 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. 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 and speaking the same language roughly triples trade between the two countries, while the common territory dummy is not significant. 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 pair-specific factors.

Comparing these results with the pooled OLS estimator (which excludes country pair-specific effects), as employed in the earlier papers in the literature surveyed in the previous sections, also suggests that 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 (including 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 ignoring country-pair specific factors is not negligible. Likewise, a specification using country-specific effects (instead of country-pair specific effects) in column (4) shows coefficients for some variables deviating sizeably from the standard FE estimator. The coefficients of both the distance term and the common territory variable are much higher (in absolute terms) and the EU dummy even becomes significantly negative. In line with Egger and Pfaffermayr (2002), this suggests that specifications employing country-pair fixed effects are required to get unbiased coefficient estimates.

The robustness of the fixed effect coefficient estimates in column (1) 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 CEE countries). 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

[13] 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.

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, column (5), are close to the results of the FE-estimator suggesting that the potential bias from the FE-specification should be small.[14]

As a second robustness check, the sample was reduced in two ways. First, column (6) presents estimation for a nearly balanced sample between 1992 and 2003. Second, only the OECD countries were included in the FE-estimation presented in column (7). In both specifications, several variables used in the full model drop out as there are no relevant observations (e.g. Mercosur, Asean). The number of observations used in these models drops to about 33,000 for the sample starting in 1993 and to 10,000 in the OECD sample, i.e. by roughly 80% in the latter. Nonetheless, the coefficients broadly retain their signs and significance. GDP is still highly significant and the coefficients are close to those estimated in the full model. The dummy for Nafta remains positive but is either smaller compared to the previous specification (OECD sample) or even becomes insignificant, the EU dummy remains significant in the sample starting in 1993 but becomes significant and positive in the specification using OECD countries. The second step suggests that the coefficients of the time-invariant variables are broadly unchanged in the specification with the truncated sample while they are somewhat smaller in absolute terms in the OECD specification; particularly speaking a common language seems to have a smaller impact, possibly reflecting the exclusion of former colonies in this sample. While the standard errors of the OECD regression are generally somewhat larger, the goodness-of-fit of the model is even better than for the broader model suggesting that the larger database also encompasses significant noise.

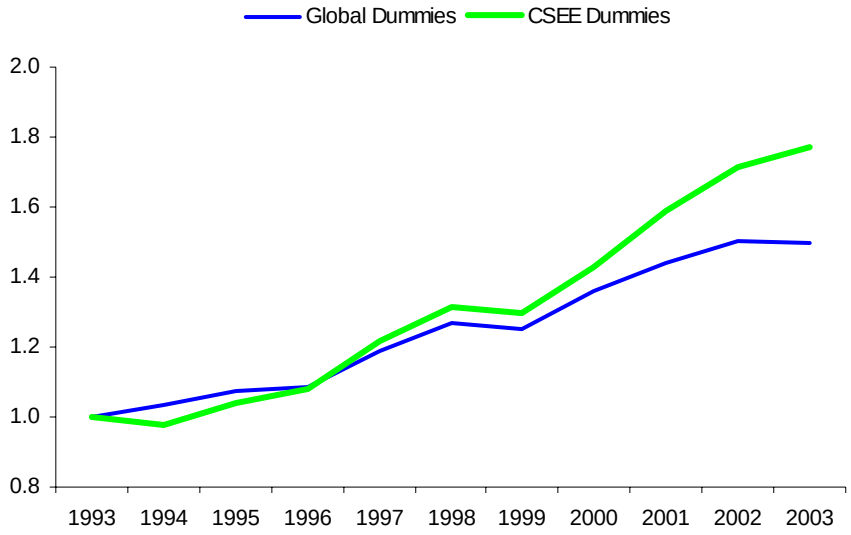
As an additional robustness test, we used region-specific time dummies (column (8) in Table 1) instead of global time dummies (as in all other regressions). The motivation for using these region-specific dummy variables is that the global time dummies used in equation (1) to (7) only pick up the average globalisation pattern, ignoring that the pace of globalisation may be different across regions. In particular, we expect trade across OECD countries to rise at a slower pace than trade involving the CSEE countries on average, the former group of countries trading at levels close to potential, and the latter closing the gap during the 1990s. We therefore created three different sets of time dummies: one set of dummies equal to one for country pairs including at least one CSEE country and zero otherwise, one set of dummies equal to one for trade between two OECD countries, and one set of dummies for the other countries (i.e., non-OECD countries excluding the CSEE countries).

The coefficients of column (7) are broadly similar to those of column (1). One important exception is the coefficient on the EU dummy variable, possibly indicating that the effect of the European Union on trade is better accounted for when these regional differences are explicitly modelled.

[14] Based on AIC, one lead and one lag were selected.

Both the global time dummies and the CSEE time dummies increase over time, thereby encompassing the rise in international trade owing to the globalisation process. However, the coefficients on the CSEE dummies rose much faster than those of the global time dummies between 1993 and 2003, reflecting the fast increase of trade with CSEE countries (Chart 5).

Chart 5: Normalised Time Effects



(Unlogged Coefficients on Time Dummies, Normalised to 1 in 1993, Using Equations (1) and (8) in Table 1)

The so-called "augmented" gravity model frequently includes per capita income as an additional regressor to account for non-homothetic preferences and to proxy for differences in factor endowments in the countries involved. However, in the fixed effect model this has the adverse side-effect that its evolution is highly correlated with the size variable translating into a potentially severe multi-collinearity problem. Including alternatively a measure of population in the equation also did not improve the results. While the population variable could have either sign from a theoretical point of view (see Egger and Pfaffermayr, 2003), the finding in our sample that the sign of the population variable was not stable across specifications constitutes a rather disturbing characteristic. Moreover, the explanatory power of the regression did not improve. As the coefficients of the other variables were broadly unaffected by this, we decided not to include such a variable. In addition, as argued by Micco et al. (2003), the inclusion of fixed effects should lead to a high degree of collinearity between those dummies and the population, and the potential impact of the steady evolution of the population variable over time should be accounted for by also including time dummies.

Given the importance of trade liberalization within the EU documented also in the stylized facts, we now turn to the coefficient of the EU dummy in Table 1. Surprisingly, this coefficient is insignificant and small in most regressions, which seems counter-intuitive given ample evidence showing a higher impact (see for instance Egger, 2004, or Rose, 2004). However, three elements need to be considered that may account for this low effect. First, most EU member countries

joined the EU before the start of our panel in 1980.[15] As a result, the EU effect is collinear to the fixed effects for most country pairs, the only exceptions being the country pairs involving Spain and Portugal (which joined the EU in 1986), as well as Austria, Finland, and Sweden (which joined the EU in 1995). Accordingly, the coefficients reported in Table 1 reflect only the impact of EU accession for those countries that entered during the sample period, which could underestimate the actual effect.

The second argument that could explain why the EU dummy has a smaller coefficient than expected is related to the fact that many countries that joined the EU previously had a special trade agreement or historically close trade links, implying that their degree of integration was high before EU entry (effectively, this decreases the net effect of EU accession as measured by the dummy). This is in fact a general, recurrent methodological issue that concerns all free trade agreements.[16] This effect seems to be rather strong for some of the countries that joined the EU during the sample period (for instance, Austria and Germany have traditionally strong trade links). As a third factor one could mention the wave of liberalisation that spread to emerging markets in the 1980s and 1990s, raising the number of trading partners and their shares in the trade flows of the more mature economies (as reported for instance in Chart 4). One of the likely consequences of this pattern is that trade involving emerging markets has risen more quickly than trade across EU countries. This, in turn, implies that the EU effect is understated in the results because the specification does not sufficiently control for the rapid integration of the emerging markets. While there is no direct way to test this hypothesis, the results reported in column (8) in Table 1 can be interpreted as an indirect validation: once region-specific time dummies are introduced, which do control for the rapid rise in trade flows in Asia, the EU dummy variable enter the regression again significantly. Therefore, the significance and size of the EU dummy should be interpreted with some caution. Solving such methodological issues, however, would be beyond the scope of the present paper and is left for future research.

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 it is not clear *per se* whether FDI impacts trade or the reverse, while FDI is at the same time considered as a substitute for trade (see Markusen and Venables, 1998, and Egger and Pfaffermayr, 2004). Thirdly, bilateral FDI data appear to be subject to significant quality constraints. Tentative results indicate that FDI enters the regression with a positive sign, but a low (though significant) coefficient. Clearly, more research on this issue is needed before a better picture can be reached.

---

[15] This statement of course does not apply to the ten so-called "new EU member states" that joined the EU in 2004. By contrast, it largely applies to Greece, which joined the EU in 1981.

[16] See in particular Dorrucci et al. (2002) as well as Mongelli, Dorrucci and Agur (2004) and the references therein.

5. Interpretation of the results

5.1. Extracting information from country-heterogeneity

The country-pair 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-pair 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 closed economy. Accordingly, aggregating the country-pair specific effects for a country over all partner countries provides an indication of the country's average degree of integration into the world economy. More formally, from equation (2), the residuals denoted by $\hat{\mu}_{ij}$ are aggregated for a country *h* into a simple "trade condition indicator", tci_h:

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

These trade condition indicators, which represent the average residual of the second stage regression, correspond to the part of the fixed effects which are not explained by the fundamental variables used in this second stage regression, such as distance. For a given country, a high trade condition indicator (TCI) indicates that this country has on average strong trade links with the rest of the world, controlling for the standard fundamentals. Chart 6 ranks the trade condition indicator for all countries in descending order.

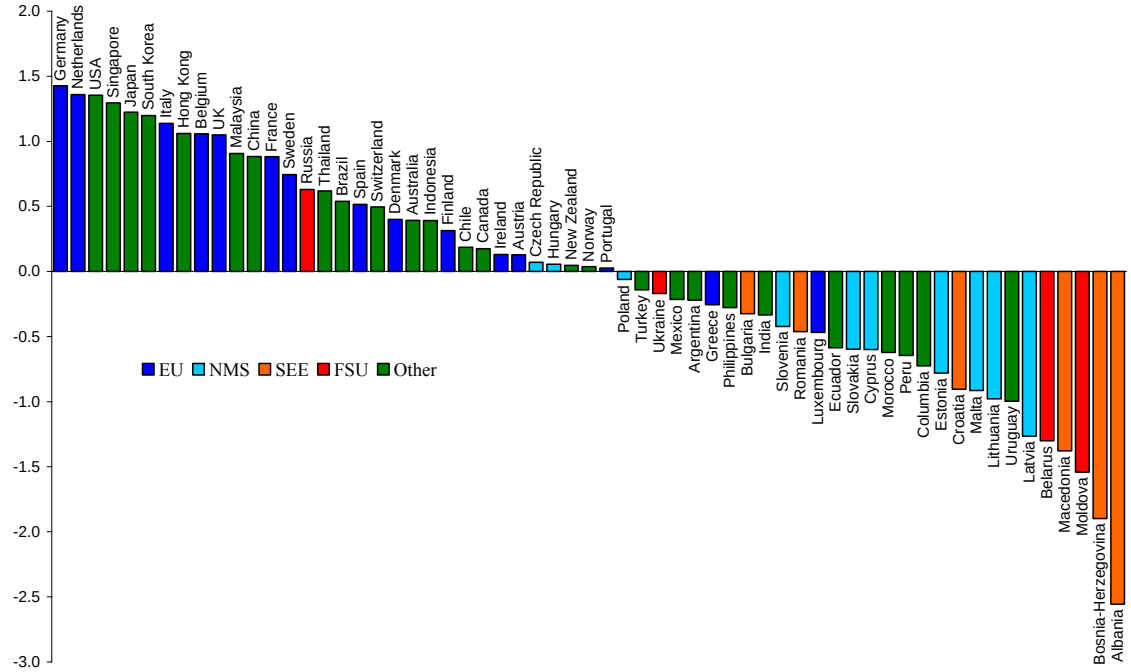
This provides several insights. Firstly, the degree of heterogeneity across countries is considerable, as signified by the variance of the indicators. Secondly, the industrialised countries tend to display above-average trade integration. For example, Germany, the Netherlands and the USA trade about three times more (=exp(tci_h) – 1) than an average country in our sample after controlling for the relevant fundamentals.[17] Thirdly, among emerging market economies mainly South-East Asian countries show a high average fixed effect and, thus, little overall trade resistance.[18] Fourthly, the CEE countries 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 SEE countries; Bosnia-Herzegovina and Albania reach only 15% and 8% of the average trade level, respectively,

[17] Exceptions are Luxembourg and Greece which 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.

[18] This may partly reflect strong intra-regional integration and a relatively low domestic value-added in their exports. For instance, Singapore and South Korea trade about 2.5 times above the average.

suggesting that these countries still have a significant potential to integrate more into the world economy.[19]

Chart 6: Trade Conditions Indices by Countries, Integration in World Markets



Note: The trade condition indices are defined, for a given country, as the average residuals (across all trading partners) of the second stage regression presented in column (7), Table 1. They can be interpreted as the part of the fixed effects which is orthogonal to the time invariant variables, i.e., as the level of integration with all trading partners controlling for our explanatory variables.

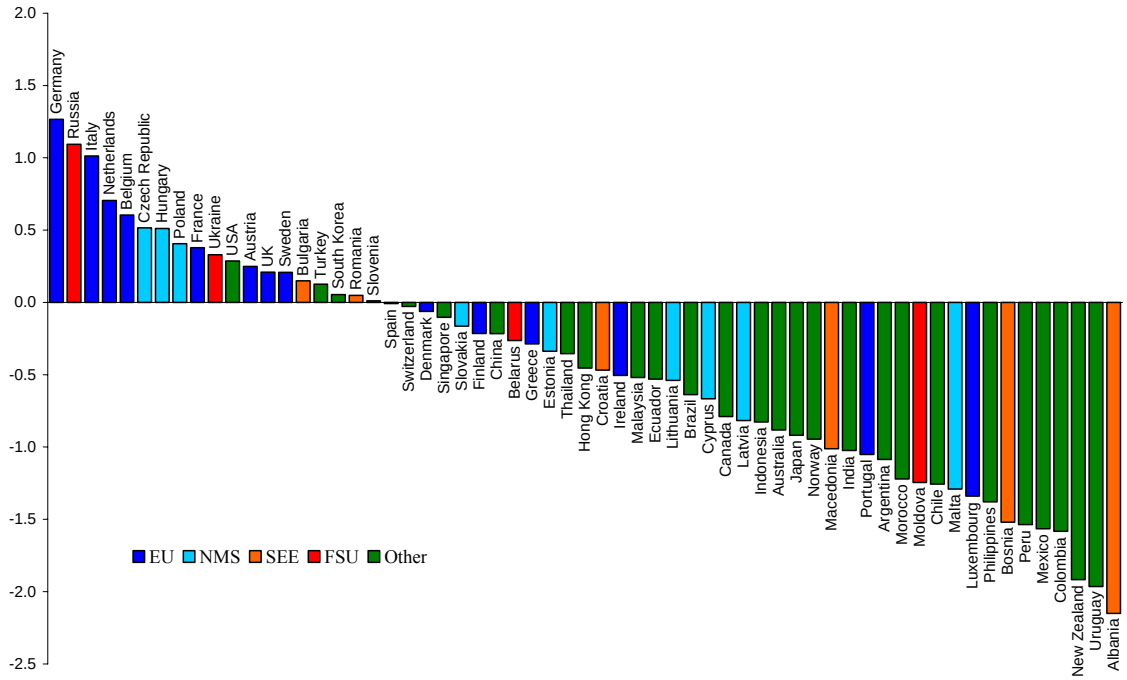
In order to shift the focus again to the CSEE countries, the trade condition indicator has been computed for country pairs including only these countries. This measure – ranked again in descending order in Charts 7 – provides information about the degree of integration of each country in the sample with the CSEE countries. The distribution of the trade condition indicators is apparently more skewed to the right and only relatively few countries are above the sample average, which broadly confirms the above result that both regions do still have significant potential to integrate into the world economy.

Comparing the indicators shown in Charts 7 to those in Chart 6 provides insights on trade potentials and trade re-direction of the countries CSEE countries. For example, Chart 6 and Charts 7 showed that Germany is well integrated with all countries and also with the CSEE countries. For assessing the scope for additional integration of these countries with Germany, Charts 7 need to be interpreted conditional on the information provided in Chart 6. This suggests that the CSEE countries are already very well integrated among themselves and of these countries with the countries of the former Soviet Union, which may reflect their common historical ties. At the same time these countries are also fairly well integrated with several euro area countries –

[19] As these economies were in a transition process in the estimation period, the intercept terms for these countries need to be interpreted with caution (see the discussion in section 5.2).

particularly with Austria, Italy and Germany – while there seems to be more scope for integration with the smaller euro area countries. By contrast, there seems to be significant scope for the CSEE countries with more distant countries such as Japan and the United States as well as the emerging markets in Asia and Latin America.

Chart 7: Trade Conditions Indices by Countries, Integration of the CSEE countries



Note: The trade condition indices presented in Chart 7 are defined, for a given country, as the average residuals (across all trading partners belonging to CSEE countries) of the second stage regression presented in column (7), Table 1, minus the TCIs presented in Chart 6. They can be interpreted as the level of integration with CSEE countries controlling for our explanatory variables and for the average level of integration with the rest of the world.

5.2 How can we interpret trade potentials of the CSEE countries?

An alternative way to analyse "normal" (that is, compared to the model predictions) trade levels of the CSEE countries is based on the fitted values of the estimated equations. However, while fitted values derived from equation (3) – based on the right-hand side variables and fixed (country-pair) effects – principally provide insights of the evolution of the market integration of the countries included in the sample with the euro area, they are subject to a methodological shortcoming for transition economies as illustrated in the following.

The dotted lines in Chart 8 show the ratio of the fitted and actual values of each CEEC/SEEC (denoted by m) vis-à-vis the total trade of 12 euro area countries (denoted by n), which is computed as follows:[20]

[20] 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.

$$ratio1_m = \ln\left(\frac{\sum_{n=1}^{12}\exp(T_{mnt})}{\sum_{n=1}^{12}\exp(\hat{T}_{mnt})}\right)$$

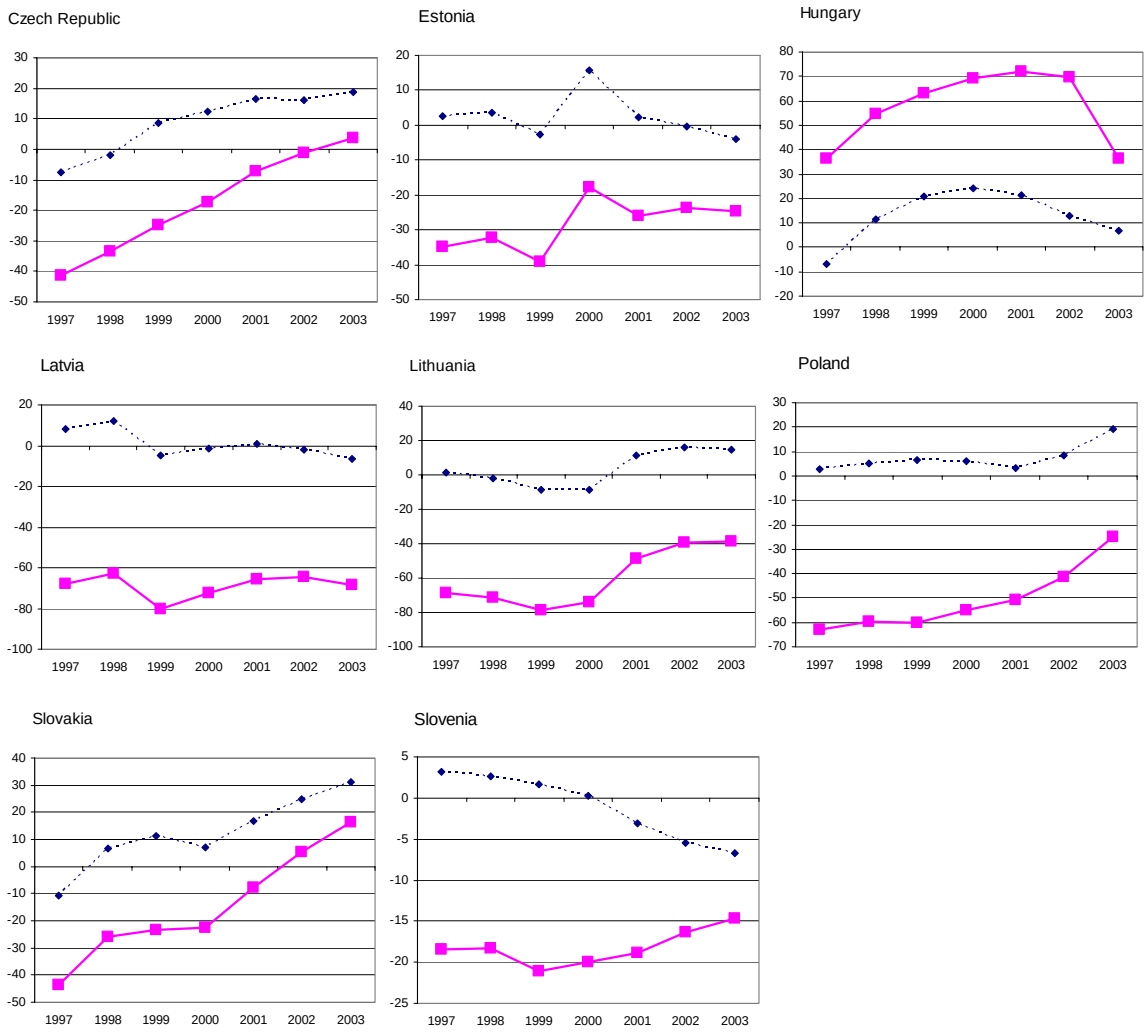
Positive (negative) values of this ratio in particular years indicate that trade of this country with the euro area (in levels) is above (below) its "potential". The ratios are for almost all CSEE countries relatively close to the zero-line. However, for some countries, the indicator suggests that these countries have exceeded their "normal" level of trade with the euro area in recent years, while negative values are reported for the beginning of the transition period. This result is particularly strong for the SEEC (e.g. Albania), which contradicts the conclusions of the previous section, according to which these countries still have substantial room to integrate into the world economy.

This finding may reflect a methodological problem. As these economies were in a transition process over the estimation period, they quickly improved their trade performance with the euro area as trade was *growing* above potential.[21] However, the increase in trade may reflect a move towards "potential" level of trade, which goes beyond what is explained by the growth in output. After the CEE countries opened up in the early 1990s, it seems that a number of factors which are difficult to measure introduced a wedge between actual trade and the trade flows computed by the model. For instance, Falcetti et al. (2005) indicate that *"in all transition countries it has taken time for businesses to make new contacts, acquire new marketing skills and convince clients abroad that they will be reliable partners."* Moreover, they suggest that the break-up of former Yugoslavia and the subsequent conflicts had a devastating effect on trade relations in the whole region. One could add to this list the underdevelopment of infrastructures, particularly transport facilities, which took time to build. This process may have lasted for an extended period implying that some of these countries could not have reached their potential trade level with the euro area yet. For other countries, most obviously some SEE countries, numerous institutional factors captured by the fixed effects were playing an important role during the 1990s but have decreased since then. These factors may have held bilateral trade below its "potential" level. However, by construction the fixed effects in the regression are estimated to ensure that the residuals of the regression are on average zero for the estimation period for each country pair. The "wedge" created by the aforementioned historical factors can also be visualised on Chart 5 by the growing size of the region-specific time dummies for the CSEE countries. Technically, this implies that the intercept terms for these countries are likely to be distorted, which may also to some extent affect the coefficient estimates.

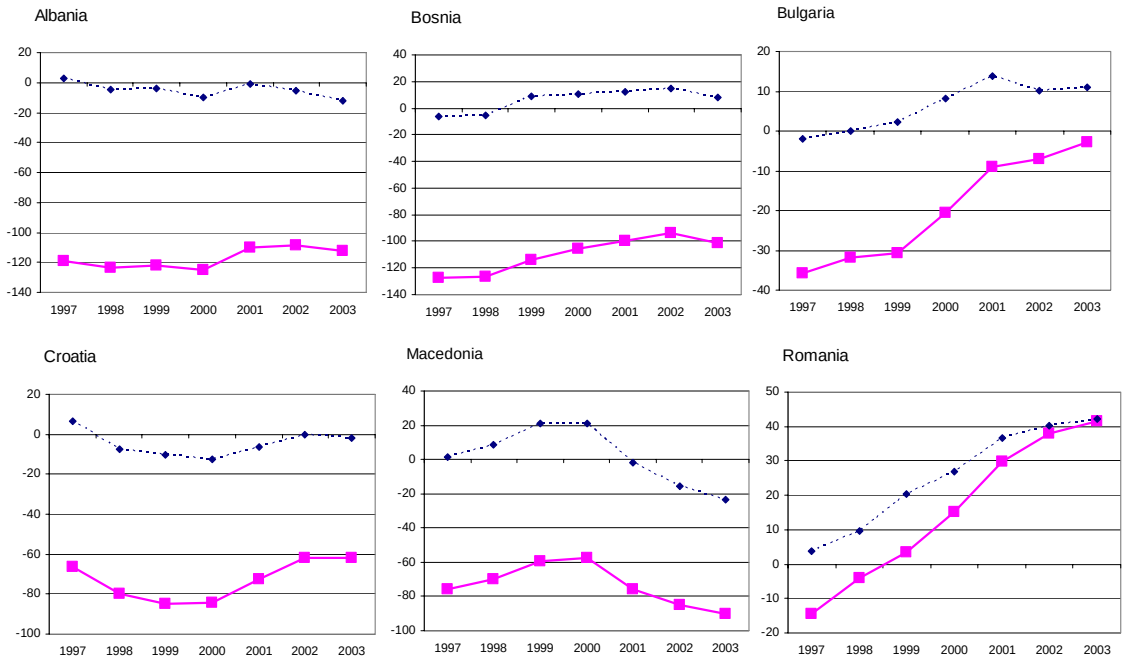
[21] For a similar discussion of the effect of the transition process on the estimation of equilibrium exchange rates for these countries, see Maeso-Fernandez et al. (2004).

Chart 8: Ratio of Actual Trade to Potential Trade of the SCEE countries with the euro area

a) Central and Eastern European Countries (ratio1 = dotted line; ratio2 = solid line)



b) South Eastern European Countries (ratio1 = dotted line; ratio2 = solid line)



Note: scale may differ across charts to enhance readability.

In order to account for this, we suggest an alternative – "out-of-sample" – methodology to compute "normal" trade levels for the CSEE with the euro area: Firstly, we use the coefficient estimates (fixed effects excepted) for the OECD sample (see column 7 of Table 1) in order to avoid the methodological drawbacks outlined above. Secondly, we add the trade condition indicator from equation (3) for each euro area country as it represents the average trade resistance of each euro area country assuming that in the medium term each CSEEC will be facing largely comparable conditions like the average euro area trading partners. Accordingly, the ratio of actual trade to "potential" trade can be expressed as:

$$ratio2_m = \ln\left(\frac{\sum_{n=1}^{12}\exp(T_{mnt})}{\sum_{n=1}^{12}\exp(\theta_t + \hat{\beta}_1 y_{nmt} + \hat{\beta}_2 d_{nm} + \hat{\beta}_3 q_{nt} + \hat{\beta}_4 q_{mt} + \sum_{k=1}^{K}\hat{\gamma}_k Z_{nm} + tci_n)}\right)$$

The results – shown as solid lines in Chart 7 – shed more light on the fixed-effects findings presented in the previous section. Among the CEE countries, they suggest that the Czech Republic and the Slovak Republic have been approaching their trade potential in recent years and trade currently even slightly above its "potential" level. In the Baltic countries, Poland and Slovenia, by contrast, there is still some potential for raising their market share in the euro area. For Poland, Lithuania and Slovenia, data since 2000 suggests that the gap between actual and potential trade has been narrowing, in some cases substantially. The pattern for Hungary, suggesting that trade with the euro area exceeded its potential rather significantly in recent years, is noteworthy but not uncommon in the literature (see for instance Fontagné et al., 1999). Turning to the SEEC, Bulgaria and Romania experienced a strong rise in trade with the euro area between 1997 and 2003. The model suggests that trade links between Romania and the euro area are very strong already, thereby confirming earlier results by Havrylyshyn and Al-Atrash (1998). By contrast, Albania, Bosnia, Macedonia and – to a lesser extent – Croatia still have significant leeway to raise their trade intensity with the euro area.

6. Conclusions

This paper analysed the rapid trade integration that took place in the past decade between the CSEE countries and the euro area. Estimations from an enhanced gravity model show that this rapid integration reflects both developments in the fundamentals suggested by the gravity model and a gradual convergence towards "normal" trade levels. Due to their geographical proximity with the euro area and their GDP levels, it is natural for these countries to have a significant share of their trade with the euro area. The results seem to suggest that trade of these countries was low – compared to what the model indicates – at the beginning of the transition process and converged to more normal levels over time.

For most of the large CEE countries, trade flows approached their "potential" level in recent years, suggesting that while there is still some scope to increase their market share in the euro area, the pace of trade integration of these countries with euro area countries may slow down in coming years. Thus, both the stylized facts and the estimation results show that the CEE countries have made progress towards more complete trade integration into the world economy. This was only partly accomplished by a reorientation away from trade with the former Eastern European countries as we find that Russia, Ukraine and some CEE countries are still very important trading partners in the region (given the economic size of these countries). However, the CEE countries trade less than what the model predicts with smaller or more distant countries both in Europe and in the world economy. Finally, the smaller SEE countries – Albania, Bosnia, Macedonia – demonstrate a low degree of trade integration with the euro area and the world economy. As the potential for market integration of the CSEE countries with more distant industrialised countries and emerging economies seems to be higher than with the euro area, it would seem natural if the share of the euro area in these countries' trade declines somewhat.

Abstracting from those findings on the degree of trade integration, the paper also highlights some important methodological issues. Firstly, we document significant heterogeneity of the trade intensity across countries, translating into a significant bias in standard OLS estimations. Secondly, 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. Finally, we show that the predicted trade values derived from the gravity model may be biased if we do not take into account adjustments to standard trade conditions after the opening-up of Eastern Europe, which may translate into distorted estimates for the fixed effects.

References

Anderson, J.E. (1979). "A theoretical foundation for the gravity equation." *American Economic Review* 69, 1, 106-116.

Anderson, J. E. and E. van Wincoop (2003). "Gravity with gravitas: a solution to the border puzzle." *American Economic Review*, 93, 1, 170-192.

Baldwin, Richard E. (1994). "Towards an integrated Europe." CEPR, London.

Cheng, I-H. and H. J. Wall (2005). "Controlling for heterogeneity in gravity models of trade and integration. " *Federal Reserve Bank of St. Louis Review*, 87, 1, 49-63.

Christie, E. (2002). "Potential trade in Southeast Europe: a gravity model approach." Working Paper No. 21, The Vienna Institute for International Economic Studies, Vienna.

Christie, E. (2004). "Trade flows in Southeast Europe." Mimeo, The Vienna Institute for International Economic Studies, Vienna.

Deardorff, A.V. (1995). "Determinants of bilateral trade: does gravity work in a neoclassical world?" Working Paper, 5377, NBER, Cambridge.

Djankov, S. and B. Hoekman (1997). "Determinants of the export structure of countries in Central and Eastern Europe." *World Bank Economic Review*, 11, 3, 471-87.

Dorrucci, E., S. Firpo, M. Fratzscher and F. P. Mongelli (2002). "European Integration: what lessons for other regions? The case of Latin America." ECB Working Paper No. 185 and *Open Economies Review*, 2004, 15, 3.

Egger, P. (2003). "An econometric view on the estimation of gravity models and the calculation of trade potentials." *The World Economy*, 25, 2, 297-312.

Egger, P. (2004). "Estimating regional trading bloc effects with panel data." *Weltwirtschaftliches Archiv*, 140, 1, 151-166.

Egger, P. and M. Pfaffermayr (2003). "The proper panel econometric specification of the gravity equation: A three-way model with bilateral interaction effects." *Empirical Economics*, 28, 571-580.

Egger, P. and M. Pfaffermayr (2004). "Distance, trade and FDI: a Hausman-Taylor SUR approach." *Journal of Applied Econometrics*, 19, 2, 227-246.

Falcetti, E, P. Sanfey and S. Tepic (2005). "South-East Europe: opportunities and potential for investment and growth." Mimeo, paper presented at the ECB on 15 February 2005.

Faruqee, H. (2004). "Measuring the trade effects of EMU." IMF Working Paper No. 04/154, Washington D.C.

Fidrmuc, J. (2004). "The core and the periphery of the world economy." *Journal of International Trade & Economic Development*, 13, 1, 89-106.

Fidrmuc J. and J. Fidrmuc (2003). "Disintegration and trade." *Review of International Economics,* 11, 5, 811-829.

Fontagné, L., M. Freudenberg and M. Pajot (1999). "Has the trade potential with Central and Eastern European countries been exhausted ?". *Revue Economique*, 50, 6, 1139-1168.

Fontagné, L., M. Pajot and J.-M. Pasteels (2002). "Trade potential among heterogeneous countries: a short user's guide". *Economie et Prévision*, 152, 153, 115-139.

Graham, C., J. Helliwell, T. Kano, J. Murray, L. Schembri (2004). "The Euro and Trade: Is There a Positive Effect?." Mimeo, presented at the Annual Meetings of the Canadian Economics Association, 25 May.

Hamilton, C. B. and A. L. Winters (1992). "Opening up International Trade with Eastern Europe." *Economic Policy*, April, 78-115.

Jakab, Z., Kovács, M. A. and A. Oszlay (2001). "How far has trade integration advanced? An Analysis of the actual and potential trade of three Central and Eastern European countries." *Journal of Comparative Economics*, 29, 2, 276-292.

Hausman, J. A. and W. E. Taylor (1981). "Panel data and unobservable individual effects." *Econometrica*, 49, 6, 1377-1398.

Havrylyshyn, O. and H. M. Al-Atrash (1998). "Opening up and geographic diversification of trade in transition economies." Working Paper No. 98/22, IMF, Washington D.C.

Kaminski, B., Wang, Z. K. and L. A. Winters (1996). "Trade performance, export reorientation in the transition." *Economic Policy*, October 1996, 421-442.

Mátyás, L. (1997). "Proper econometric specification of the gravity model." *The World Economy*, 20, 3, 363-368.

Kao, C. and M.-H Chiang. (2000). "On the estimation and inference of cointegrated regression in panel data." *Advances in Econometrics* 15, 179-222.

Linder, S. (1961). "An essay on trade and transformation." Uppsala: Almqvist and Wiksells.

Linnemann, H. (1966). "An econometric study of international trade flows." Amsterdam: North Holland.

Maeso-Fernandez, F., C. Osbat and B. Schnatz (2004). "Towards the estimation of equilibrium exchange rates for CEE acceding countries: methodological issues and a panel cointegration perspective." ECB Working Paper Series No. 353, Frankfurt am Main.

Markusen, J.R. and A.J. Venables (1998). Multinational firms and the new trade theory. *Journal of International Economics*, 46, 2, 183-203.

Mátyás, L. (1998). "The gravity model: Some econometric considerations." *The World Economy*, 21, 3, 397-401.

Micco, A., E. Stein and G. Ordoñez (2003). "The currency union effect on trade: early evidence from EMU." *Economic Policy*, 18 (October), 315-356.

Mongelli, F. P., E. Dorrucci and I. Agur (2005). "What does European institutional integration tell us about trade integration?" mimeo, European Central Bank.

Rose, A. K. (2000). "One money, one market: estimating the effect of common currencies on trade." *Economic Policy: A European Forum*, 15 (April): 7-45.

Rose, Andrew K., 2004, "Do we really know that the WTO increases trade," *American Economic Review*, 94, 1, 98-114.

Serlenga, L. and Y. Shin (2004). "Gravity models of the intra-EU trade: application of the Hausman-Taylor estimation in heterogeneous panels with common time-specific factors." University of Edinburgh, Mimeo.

Vujčić, B. and V. Šošić (2004). "Trade integration in South-East Europe and the trade potential of Croatia", in: Liebscher, K., Christl, J., Mooslechner, P. and D. Ritzberger-Grünwald (Eds.) The Economic Potential of a Larger Europe, Edward Elgar, London, 127-144.

Data Appendix

Countries included: Albania[2], Algeria, Argentina[4], Australia, Austria, Belarus, Belgium, Bosnia[2], Brazil[4], Bulgaria[2], Canada, Chile[4], China, Colombia[4], Croatia[2], Cyprus, Czech Republic[1], Denmark, Ecuador[4], Estonia[1], Finland, France, Germany, Greece, Hong Kong[3], Hungary[1], India, Indonesia[3], Ireland, Italy, Japan, Latvia[1], Lithuania[1], Luxembourg, Macedonia[2], Malaysia[3], Malta, Mexico[4], Moldova[2], Morocco, Netherlands, New Zealand, Norway, Peru[4], Philippines[3], Poland[1], Portugal, Romania[2], Russia, Singapore[3], Slovak Republic[1], Slovenia[1], South Korea[3], Spain, Sweden, Switzerland, Thailand[3], Turkey, United Kingdom, Ukraine, Uruguay[4], USA.

Country aggregates: 1/ Central and Eastern European Countries (CEEC), 2/ South Eastern European Countries (SEEC), 3/ Rest of Asia (ROA), 4/ Latin America.

Trade data: IMF DOTS.

GDP: IFS line 99b. For Ecuador data from WDI. Data for Greece up to 1994 from WDI. Date for Turkey up to 1985 from WDI. If there was a large discrepancy between World Bank and IMF data, observations have been dropped. This includes Argentina (1980-84), Bulgaria (1985-92), China (1980-1993), Estonia, Latvia, Lithuania (each 1993-95), Moldova (1995), Russia (1993-94), Ukraine (1993-95), For Albania, Bosnia and Herzegovina, Moldova and Macedonia data from EBRD.

Distance: Great circle distances based on MS Encarta World Atlas software.

Exchange rate: IFS line rf. Exchange rates for individual euro area countries were chain-lined with the euro exchange rate upon EMU entry.

Consumer prices: IFS line 64. For Belarus, China, Russia and the Ukraine, inflation rates (IFS line 64.xx) were transformed into price indices.

Industrial producer price: IFS line 63a for the United States.

Real exchange rate: Product of the US dollar exchange rate and the ratio of domestic and foreign consumer prices.

Exchange rate volatility: Standard deviation of the month-on-month log changes in the bilateral nominal exchange rate within a year.

Common border: A matrix is available upon request.

Common language: Based on a matrix including the following languages: English (Australia, Canada, India, Ireland, Hong Kong, Malta, New Zealand, Philippines, Singapore, United Kingdom and the USA), Spanish (Argentina, Chile, Colombia, Ecuador, Mexico, Peru, Spain, Uruguay, Venezuela), French (Algeria, Belgium, Canada, France, Luxembourg, Morocco, Switzerland), German (Austria, Germany, Luxembourg, Switzerland), Chinese (China, Hong Kong, Singapore), Russian (Belarus, Estonia, Latvia, Lithuania, Moldova, Russia, Ukraine), Dutch (Belgium, Netherlands), Greek (Greece, Cyprus), Arabic (Algeria, Morocco), Serbo-Croatian (Bosnia, Croatia, Slovenia), Portuguese (Brazil, Portugal), Swedish (Sweden, Finland), Albanian (Albania, Macedonia), Malay (Malaysia, Singapore).

Free-trade agreement (the year when such an agreement was established or when a country entered such an arrangement after 1980 is indicated in parenthesis after the respective

arrangement/country)**:** ***ASEAN Association of South East Asian Nations (1992):*** Brunei, Darussalam, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, Vietnam, ***CEFTA Central European Free Trade Agreement (1994):*** Bulgaria (1999), Czech Republic, Hungary, Poland, Romania, Slovak Republic, Slovenia (1997)***, European Union*** (EU15): Austria (1995), Belgium, Denmark, Finland (1995), France, Germany, Greece (1981), Ireland, Italy, Luxembourg, Netherlands, Portugal (1986), Spain (1986), Sweden (1995), United Kingdom, ***European Union*** (EU15) and ***Customs Unions***: EU15, Cyprus, Malta, Turkey (1996); ***MERCOSUR Southern Common Market (1993):*** Argentina Brazil Paraguay Uruguay, ***NAFTA North American Free Trade Agreement:*** Canada (1988), Mexico (1993), United States (1988).

Common territory includes countries which constituted in the past 20 years at some point a common country. They include a) former Czechoslovakia (the Czech Republic and the Slovak Republic), b) countries of the former Soviet Union (Belarus, Estonia, Latvia, Lithuania, Moldova, Russia and the Ukraine, and c) countries of former Yugoslavia (Bosnia, Croatia, Macedonia, Slovenia).

Table Appendix

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: Trade Market Shares, Central and Eastern European countries.
Percentage of total exports and imports by destination in 2003.

	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.

European Central Bank working paper series

For a complete list of Working Papers published by the ECB, please visit the ECB's website (http://www.ecb.int)

509 "Productivity shocks, budget deficits and the current account" by M. Bussière, M. Fratzscher and G. J. Müller, August 2005.

510 "Factor analysis in a New-Keynesian model" by A. Beyer, R. E. A. Farmer, J. Henry and M. Marcellino, August 2005.

511 "Time or state dependent price setting rules? Evidence from Portuguese micro data" by D. A. Dias, C. R. Marques and J. M. C. Santos Silva, August 2005.

512 "Counterfeiting and inflation" by C. Monnet, August 2005.

513 "Does government spending crowd in private consumption? Theory and empirical evidence for the euro area" by G. Coenen and R. Straub, August 2005.

514 "Gains from international monetary policy coordination: does it pay to be different?" by Z. Liu and E. Pappa, August 2005.

515 "An international analysis of earnings, stock prices and bond yields" by A. Durré and P. Giot, August 2005.

516 "The European Monetary Union as a commitment device for new EU Member States" by F. Ravenna, August 2005.

517 "Credit ratings and the standardised approach to credit risk in Basel II" by P. Van Roy, August 2005.

518 "Term structure and the sluggishness of retail bank interest rates in euro area countries" by G. de Bondt, B. Mojon and N. Valla, September 2005.

519 "Non-Keynesian effects of fiscal contraction in new Member States" by A. Rzońca and P. Ciżkowicz, September 2005.

520 "Delegated portfolio management: a survey of the theoretical literature" by L. Stracca, September 2005.

521 "Inflation persistence in structural macroeconomic models (RG10)" by R.-P. Berben, R. Mestre, T. Mitrakos, J. Morgan and N. G. Zonzilos, September 2005.

522 "Price setting behaviour in Spain: evidence from micro PPI data" by L. J. Álvarez, P. Burriel and I. Hernando, September 2005.

523 "How frequently do consumer prices change in Austria? Evidence from micro CPI data" by J. Baumgartner, E. Glatzer, F. Rumler and A. Stiglbauer, September 2005.

524 "Price setting in the euro area: some stylized facts from individual consumer price data" by E. Dhyne, L. J. Álvarez, H. Le Bihan, G. Veronese, D. Dias, J. Hoffmann, N. Jonker, P. Lünnemann, F. Rumler and J. Vilmunen, September 2005.

525 "Distilling co-movements from persistent macro and financial series" by K. Abadir and G. Talmain, September 2005.

526 "On some fiscal effects on mortgage debt growth in the EU" by G. Wolswijk, September 2005.

527 "Banking system stability: a cross-Atlantic perspective" by P. Hartmann, S. Straetmans and C. de Vries, September 2005.

528 "How successful are exchange rate communication and interventions? Evidence from time-series and event-study approaches" by M. Fratzscher, September 2005.

529 "Explaining exchange rate dynamics: the uncovered equity return parity condition" by L. Cappiello and R. A. De Santis, September 2005.

530 "Cross-dynamics of volatility term structures implied by foreign exchange options" by E. Krylova, J. Nikkinen and S. Vähämaa, September 2005.

531 "Market power, innovative activity and exchange rate pass-through in the euro area" by S. N. Brissimis and T. S. Kosma, October 2005.

532 "Intra- and extra-euro area import demand for manufactures" by R. Anderton, B. H. Baltagi, F. Skudelny and N. Sousa, October 2005.

533 "Discretionary policy, multiple equilibria, and monetary instruments" by A. Schabert, October 2005.

534 "Time-dependent or state-dependent price setting? Micro-evidence from German metal-working industries" by H. Stahl, October 2005.

535 "The pricing behaviour of firms in the euro area: new survey evidence" by S. Fabiani, M. Druant, I. Hernando, C. Kwapil, B. Landau, C. Loupias, F. Martins, T. Y. Mathä, R. Sabbatini, H. Stahl and A. C. J. Stokman, October 2005.

536 "Heterogeneity in consumer price stickiness: a microeconometric investigation" by D. Fougère, H. Le Bihan and P. Sevestre, October 2005.

537 "Global inflation" by M. Ciccarelli and B. Mojon, October 2005.

538 "The price setting behaviour of Spanish firms: evidence from survey data" by L. J. Álvarez and I. Hernando, October 2005.

539 "Inflation persistence and monetary policy design: an overview" by A. T. Levin, and R. Moessner, November 2005.

540 "Optimal discretionary policy and uncertainty about inflation persistence" by R. Moessner, November 2005.

541 "Consumer price behaviour in Luxembourg: evidence from micro CPI data" by P. Lünnemann and T. Y. Mathä, November 2005.

542 "Liquidity and real equilibrium interest rates: a framework of analysis" by L. Stracca, November 2005.

543 "Lending booms in the new EU Member States: will euro adoption matter?" by M. Brzoza-Brzezina, November 2005.

544 "Forecasting the yield curve in a data-rich environment: a no-arbitrage factor-augmented VAR approach" by E. Mönch, November 2005.

545 "Trade integration of Central and Eastern European countries: lessons from a gravity model" by M. Bussière, J. Fidrmuc and B. Schnatz, November 2005.