

EU integration with Mediterranean partner countries vis-à-vis CEE-10. A gravity study.

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Abstract[#].

The European Union is putting strong political emphasis on the integration process with the Third Mediterranean countries involved in the 1995 Barcellona process (Med12) but trade achievements are still poor. Conversely, most studies suggest that a level of trade integration between Eastern and Western countries high and above the potential has already been reached supporting the thesis that the adjustment is already completed. We use the gravity analysis to measure the different speeds of trade integration of the EU with these two areas. We adopt different panel estimators of the gravity model and an “out-of-sample” methodology, i.e. we apply the parameters extracted from a gravity panel estimate of intra-EU trade flows and apply them both to trade between eleven MED countries and five EU partners (Italy, Germany, France, UK, Spain) and to trade between the CEEC-10 and the same five EU partners. In this way, we aim to answer two main questions: 1) what level of trade integration would have been achieved if the elasticities of trade with respect to socio-economic and geographic variables (relative mass, physical distance, common language, common border, colony links) were like those achieved in intra-EU trade according to a gravity model (trade potential)? 2) how much additional trade could be created with these two areas if integration would be further pushed (computation of the gap between potential and real values of trade)? From this approach we find evidence of the existence of an important potential of trade not yet exploited with both groups of partners although the gap between potential and real trade with the MEDs is generally showing a constant or even an increasing trend between 1995 and 2002, while EU trade with the CEECs shows a marked decline of the gap. While this result is to be expected for the MED countries it is atypical for the CEECs, since previous studies provided different results suggesting that the trade potential was already exploited in 1992. We believe that the differences between the results presented in this paper and in previous studies depend on the period of analysis and on the method used. In the previous literature cross section and “in sample” methods were generally adopted while only in a few cases were deployed panel analysis and out-of-sample methods but using GDP data which were depressed by the transition phase which underestimated the trade potential. We use panel analysis and out-of-sample predictions and concentrate on a later period (after 1995) when GDP was much higher and on the rise in most CEECs. We tested the robustness of our results computing the indices of trade potential based on different estimation methods. The results were remarkably stable across different specifications.

JEL Classification: F15 (Economic integration); F17 (Trade forecasting and simulation); K33 (International Law); P45 (International linkages); P52 (Comparative studies of particular economies)

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Introduction

In the last decade, gravity models have been extensively used to forecast potential bilateral trade relations and integration effects between EU or OECD countries and the former COMECON members (Wang and Winters, 1992; Hamilton and Winters, 1992; Baldwin, 1994; Gros and Gonciarz, 1996; Matyas, 1997; Brulhart and Kelly, 1999; Brenton and Di Mauro, 1999; Gros and Gonciarz, 1996; Brenton and Gros, 1997; Fontagnè et al., 1999; Nilsson, 2000; Egger, 2000, 2002, 2003; Christie, 2002). Conversely, gravity analysis has been rarely used to measure the potential volume and direction of trade between the South Mediterranean countries (MED from now)¹ and the EU². One of the aims of this paper is to attempt to fill this gap and to compare the degree of integration of CEE and MED economies with the EU by using gravity analysis, indirectly providing an assessment of the relative success of the Europe Agreements versus the Mediterranean Agreements.

There are at least two linked reasons for this negligence of the trade literature. First, high barriers to trade³ along with remarkable social and economic differences undermine the perspectives of enhanced financial and commercial integration between the two shores of the Mediterranean while the same process seems to be quite smooth between the Eastern and the Western side of the EU. Second, the policy makers have put more emphasis on the enlargement process with eight Eastern European countries started in 1992 and recently completed. The Eastward enlargement of the EU has provoked a sort of “crowding out” of the Euro-Mediterranean partnership (the “Barcelona process”) launched in 1995. Over the last decade, in view of their accession, the Central and Eastern European countries (CEECs from now)⁴ have been involved into a significant process of trade liberalisation within the preferential trade

¹ In the Eurostat definition, MED includes 12 countries of the Euro-Mediterranean Partnership: Algeria, Cyprus, Egypt, Jordan, Israel, Lebanon, Malta, Morocco, Syria, Tunisia, Turkey, Cisjordan and Gaza which are represented by the Palestinian Authority. Libya has the status of observer within the Euro-Mediterranean Partnership. However, due to the lack of data, Cisjordan and Gaza are not included in the empirical analysis.

² Few studies adopted the gravity approach to detect the Arab potential of trade with advanced economies and with the rest of the Arab world (IMF, 2002; Miniesy, Nugent and Yousef, 2004; Hassan, 1998; Al-Atrash and Yousef, 1999). However, they did not focus on the Euro-Mediterranean integration. See table 1 in the text.

³ The average degree of protection in the Euro-Mediterranean Partnership countries is high on average: for all the products, except agriculture and services, the average rate of protection is 17.5% compared to 5.2% of the CEECs (Femise, 2003). In Morocco the average rate of protection was 21% in 1997 and became 31% in 2001. In Tunisia it was constant at 20% over the last ten years. In Egypt the average rate has always been above 20% in the last decade.

⁴ By CEECs, we mean the Central and Eastern European countries as well as the Baltic Republics: Poland, Hungary, the Czech Republic, the Slovak Republic, Slovenia, Estonia, Lithuania, Latvia, Bulgaria, Romania. Notice that we include also the countries candidate to the EU membership, namely Bulgaria and Romania

agreements (Europe Agreements⁵). On the contrary, so far the EU-MED process of trade liberalisation has progressed slowly in spite of the fact that enhancing trade and investment relationships between EU and MED was one of the main targets of the “Barcelona process”⁶.

We use the gravity analysis to measure the different speeds of trade integration of the EU with these two areas. The aim is to assess how much “trade creation and diversion” took place since the liberalisation process with these two groups of partners started and how much additional trade could be created if integration would be further pushed (trade enhancing effect). Gravity analysis is a good alternative when intertemporal extrapolation of trade patterns is not feasible. A typical example is just the integration of Western countries with the CEECs. The post-war economic isolation of the CEECs, their distorted pricing structures and their recent transition from central planning to a market economy made it difficult to estimate, on the basis of extrapolation from historical patterns, the level of trade which was likely to prevail after full economic liberalisation. For similar reasons (distorted pricing structure, state intervention, scant international openness) also the integration with the MED cannot be based on historical trade performance.

We adopt a panel data specification of the gravity model and an “out-of-sample” methodology, i.e. we apply the parameters extracted from a gravity panel estimate of intra-EU trade flows and apply them both to trade between eleven MED countries and five EU partners (Italy, Germany, France, UK, Spain) and to trade between the CEEC-10 and the same five EU partners. In this way, we aim to answer two main questions: 1) what trade integration had been achieved if the elasticities of trade with respect to socio-economic and geographic variables (relative mass, physical distance, common language, common border, colony links) were like those achieved in intra-EU trade according to the gravity equation (trade potential)? 2) how much additional trade could be created if integration would be further pushed (computation of

⁵ The Europe Association Agreements were initiated by the EU with each CEEC separately. The first were with Poland, Hungary and Czechoslovakia in December 1991 which came into force in 1994. On 1st February 1993, those of Bulgaria and Romania were signed together with those of the new countries Czech Republic and Slovakia. They came into force in 1995. In 1998, Agreements with the three Baltic States came into force followed by that with Slovenia on 1st February 1999. They cover not only trade matters, but also political dialogue and cultural and economic cooperation between the partners, and provide a basic outline for the gradual integration of the CEECs in the EU. Over the period before the agreements came into force Interim Agreements provided for an anticipated and temporary application of trade provisions. Their aim was to establish a free trade area for industrial goods for no more than ten years on a reciprocal but asymmetric, basis: the EU had to remove its trade barriers more quickly than the CEECs. This led to the total removal of all tariff barriers on industrial products from the EU on 1st January 2000. However, for some “sensitive” industrial sectors a special discipline was created, in particular for textiles, iron and steel, car industry (only for Poland) and a much more gradual liberalisation was applied to agricultural goods and fisheries.

⁶ The process started in Barcelona in 1995. Association Agreements have been signed with Palestine (1997), Tunisia (1998), Morocco and Israel (2000), Egypt (still in the stage of ratification), Algeria (still in the stage of

the gap between potential values and real values of trade)? This type of analysis, being based on bilateral relationships, highlights the presence of more or less intense relations of EU with single countries. Furthermore, it answers the question of whether between 1995, when the Barcellona process started, and 2002, we observe a reduction in the gap between potential and actual trade. The results for the MED are then compared with the path followed by the CEEC-10 over the same period.

From an econometric point of view, our study differs from previous gravity works applied to trade integration issues because we calculate trade potential based on the panel data analysis and on the out-of-sample method, while in the previous literature cross section and “in sample” methods were adopted and only in a few cases panel analysis and out-of sample methods (Baldwin, 1994; Gros and Gonciarz, 1996). We try panel estimators, including Least Square Dummy Variables, Fixed effect models (FEM), Random effect models (REM), FEM AR(1), REM AR (1). For the sake of comparison we also estimate a cross section model, averaging data for 1995-2002 and for two sub-periods (1995-98 and 1999-2002), and a pooled sample⁷.

Interestingly, from this approach we find evidence of the existence of an important potential of trade not yet exploited with both groups of partners. While this result is to be expected for the MED countries, it is atypical for the CEECs, since previous studies provided different results suggesting that the trade potential was exploited already in 1992. We believe that the differences between the results presented in this paper and in previous studies depend on the period and method used. We use out-of-sample predictions and concentrate on a later period (after 1995) when GDP was much higher and on the rise in most CEECs. We tested the robustness of our results computing the indices of trade potential based on different estimation methods. The results were remarkably stable across different specifications.

The work is organised as follows. In section 2 we report a survey of the literature and of the different methodologies adopted to estimate the gap actual/potential trade with respect to MED and CEECs, describing the methodology we preferred and the reason why we chose it. In section 3 we present our econometric results. In section 4 the ratio between potential and actual trade is calculated for the MED and the CEECs separately. In the concluding remarks we summarise our main findings and draw some policy implications.

introduction), while an interim agreement was reached with Lebanon at the end of 2002. Recently, the application of these agreements had a new acceleration with the European Council of Salonicco in June 2003.

⁷ Besides, panel analysis more than the cross-section analysis might suffers for omitted relative prices, factor endowment and production structure as these variables are more important as determinants of trade patterns and of the variation of the coefficients over time. For this reason we also run cross section regressions. However, the results of our panel estimates are confirmed.

2. A survey of the literature

Table 1 provides a synoptic view of the results of the literature on CEE and MED potential trade based on gravity equations. The following features of the studies considered are reported: sample, data source, period of analysis, estimation method, specification of the equation, coefficients of the main variables of interest, method of calculation of potential/actual trade, potential/actual trade ratio. The last row of the table contains the results of our estimates. Only four studies reported applied gravity analysis to the MEDs while there is a much wider range of gravity works which have been relevant for the analysis of integration with the CEECs. We start our analysis from the latter.

Gravity models have been widely deployed over the last decade to evaluate trade flows between the EU and the CEECs because they were a simple and effective tool to make projections. In the first years of transition most studies found a strong growth potential (Wang and Winters, 1991; Hamilton and Winters, 1992; Baldwin 1994).

Wang and Winters (1991) use a gravity on data averaged for 1984-86 not including the CEECs to estimate the bilateral trade flows in a "normal" country, i.e. integrated into the world trade. Then CEECs GDP, population and distance are inserted into the equation with the data for trade with the 76 countries in the sample generating an import and export pattern for each CEEC with each of the 76 countries. The results show an East-East trade too large in 1985 while an East-West trade only equal to a fraction of what would have been in an integrated Europe.

Hamilton and Winters (1992) adopt a similar approach and obtain that trade within the former Soviet Union and the Eastern Europe bloc (SUEE) should be static or falling, while with Western Europe could increase up to fivefold; also EU trade with the SUEE will increase very significantly especially with Germany (up to 24%).

Baldwin (1994) finds that the potential EU12-CEE exports and imports are two times actual 1989 exports and imports: imports should increase rapidly over the medium term; the poor four (Spain, Portugal, Greece, Ireland) should expand more than the EU-12 average; exports of CEECs also have ratios from 1.2 to 5.2, while for intra-CEECs trade all ratios of potential to actual are less than unity (trade diverting effect of the former-CMEA)

All the works which followed support a different perspective: most studies suggest that a level of integration between Eastern and Western countries high and above the potential has long been reached hinting that the adjustment is completed and that there is no need for special

protection in Western countries (Brenton and Kendall, 1994; Gros and Gonciarz, 1996; Brenton and Di Mauro, 1999; Nilsson, 2000; Bertolini and Montanari, 2002).

Brenton and Kendall (1994) found that already in 1992 trade between EU members and CEE countries was about 25% larger than one would expect on the basis of distance and of income; also trade between CEE countries was almost 4 times higher than on the basis of the standard gravity relationship (there is no hub-and-spoke system problem).

Gros and Gonciarz (1996) makes a correction to the Baldwin's estimates considering that the GDP he adopted was overvalued because of using pre-transition data (per capita GDP used by Baldwin is 2 to 3 times higher than the actual 1992 data for CEE). Combining the parameters from Baldwin (1994) with the actual 1992 data on GDP they end up with a downward revision of Baldwin projections of CEEC-EU trade. Their results show that the adjustment is completed: projections based on 1992 data show openness level which must be considered high compared to market economies and does not indicate any remaining CEE trade potential with Western countries (the actual exports of the EU-12 in 1992 are more than twice as large as estimated potential and the imports of EU-12 from CEE-3 are also considerably higher than the potential); also intra-CEE trade potential is below one half of the potential computed by Baldwin and dramatically below actual.

Brenton and Di Mauro (1999) include a dummy in the regression equation of Germany, France, UK and USA to assess whether export flows to CEE countries are high or low relative to investment and exports to other countries in the world. They separate dummy variables for CEEC3 (Hungary, Poland and Czech R.) and CEEC2 (Bulgaria and Romania) to take into account the different speed of transition of the two groups. Their results show that the coefficients on the dummy variables for the CEEC3 are not significantly different from zero except for USA while the actual EU exports to these countries do not deviate from their potential level (only Germany and UK exports to Bulgaria and Romania are significantly below their normal or potential level).

Nilsson (2000), using the same procedure as Baldwin, in contrast with Gros and Gonciarz still found some unused trade potential between the candidate countries and the EU countries but compared to Baldwin's estimates the gap between potential and actual trade between EU and the CEECs appears greatly reduced to just 1.1 on average, and several EU countries export more to the candidate countries (CC) than the gravity model predicts; they have also reached or exceeded their estimated potential of imports except for Austria, Portugal, France, Ireland, Spain and UK. Conversely, there is still some unused trade potential between the CC and the EU countries, but on average ratio in exports to EU is 0.9 (exceeded export potential) and only

Cyprus, Czech and Slovak are above 1. High level of trade integration within the CEECs is also found as shown by the ratio potential/actual trade and by the dummy for trade of EU with CEECs which is lower than the dummy for trade between the CEECs.

A more recent study (Bertolini and Montanari, 2002) also reports that the export potential of CEECs to EU would be exhausted although not on both sides. The potential/actual trade ratio obtained for imports is 0,57 (therefore trade is beyond the potential) but at the same time the export potential of EU to CEE9 would not be completely exploited (ratio potential /real trade of 1,54), as a result of asymmetric liberalisation of trade allowed by the Europe Agreements. The poorest countries within the CEECs have the highest gap both according to Bertolini and Montanari (2002) and to Brenton and Di Mauro (1999).

This picture is partially validated by the few analyses of trade by sectors which have been carried out. Brenton and Di Mauro (1998) maintain that the flows of sensitive products are not significantly depressed relative to total trade. Bertolini and Montanari (2001) find that the EU-CEECs dummy is positive and statistically significant for imports of machinery thus indicating that East-West flows are above "normal" values". For textiles, iron and steel (sensitive products subject to a special regulation in the Europe Agreements), the EU-CEECs dummy is negative and significant for EU exports, which means that EU exports can still exhibit a wide margin of growth, while imports have reached normal values as the dummy is completely insignificant for EU imports. This result suggest that asymmetry favoured the CEECs and therefore there is no reason to expect further growth of imports of sensitive goods in Europe.

Moving to the analysis of trade potential between MED and EU we find quite a different scenario. As mentioned before while the gravity model has been extensively adopted in the empirical literature to explain bilateral trade between Eastern and Western Europe its use in the literature on MED trade with industrialised countries is almost non-existent. We have only three throughout analyses which carried out such estimate and with no exception both Arab trade with most non-Arab countries and intra-Arab trade appear quite low in relation to what would be predicted on the basis of the gravity model.

Hassan Al-Atrash and T. Yousef (2000) found that Mashreq countries compared to Maghreb and Gulf countries exhibits higher levels of integration both within the Arab area and with the rest of the world. However EU trading arrangements have not promoted greater integration among member countries. IMF (2002), which calculates the potential of MENA (Middle East North African Countries), Asia, Sub-Saharan Africa, South America and Central America using the parameter estimates from the pooled gravity model of world trade averaged for 1995-99, find that the MENA is the region which exhibits the highest degree of under-

trading second only to some countries of the South East Asia, which however, compensate with a high level of trade in services which is not included in the gravity models. Finally, Miniesy et al. (2004) estimates the predicted values based on the parameter estimates from the pooled gravity model of world trade applied to trade of each MENA country and to MENA as a whole with Arab MENA, Iran, Turkey and with the Rest of the World for 1992 obtaining actual to predicted trade ratio in percentage. They also find that in 1992 both intra-MENA and MENA trade with most non-MENA countries are low in relation to what would be predicted on the basis of the gravity model. In trade with other regions MENA is an underachiever especially with the EU and with the Eastern Europe. Arab common market, the Gulf Cooperation Council, and the three dummy variables for sub-regional trading arrangements within MENA have virtually no effect on the parameter and have a negative and often significant coefficient.

Two recent papers on the issue of trade integration measured by gravity models (Egger, 2000 and 2002) have cast a shadow on the results of the literature quoted above raising three types of criticism: 1) most of these results are based on cross-section gravity models which are misspecified as they do not take into account exporters and importers effects, while only few authors made use of panel econometric (Baldwin, 1994; Gros and Gonciarz, 1996; Mathyas, 1997, Egger, 2000; 2002; see tab. 1); 2) the authors which made use of panel analysis to compute potential trade adopted a random effect model (exception is Egger), which would be affected by the problem of correlation of the explanatory variables with the unobserved effects (see tab. 1); 3) most analyses derive information on trade potentials from the “in sample” prediction approach, i.e. the residuals of the estimated equation are interpreted as the difference between potential and actual bilateral trade relations which is in contrast with the fact that in the case of proper specification estimators are consistent and efficient and therefore should exhibit white-noise residuals and should not identify large systematic differences between observed and in-sample predicted values among country groups.

Let's go through these three weak points of the literature. The first critique risen in Egger (2002 and 2003) was also put forward by Matyas (1997, 1998) which argued that a panel framework reveals several advantages over cross-section in gravity analysis. First, panels allow to capture the relationships between the relevant variables over a longer period and to identify the role of the overall business cycle phenomenon (in cross-section research one usually employs data averages over a certain period to lower the influence of outliers). Second, through a panel approach one is able to disentangle the time invariant country-specific effects and account for the heterogeneity of country-to-country trade flow levels. Third, only in a panel framework one checks for cross-section deviations and is thus able to interpret the parameters

as elasticities of the influence of independent variables on the dependent one (within interpretation). In cross-section analysis they should be read as a composite of within and between effects (Hsiao, 1995). Besides in cross section analysis the sample has many trade flows that are either abnormally high or abnormally low, which increases the standard error and yields large confidence intervals around cross section estimates, which makes comments as to whether current flows are below or above potential often statistically meaningless (Egger, 2002 and 2003). Other arguments against the use of cross-section estimates to compute trade potential have been raised more recently in De Benedictis and Vicarelli (2003). They stress how the sign of the difference between effective and potential trade is not robust to the use of different estimators of the gravity model. In particular, they criticise the adoption of cross section estimates, which give biased coefficients and therefore are not reliable for estimating potential trade patterns. Furthermore, they stress that the computation of standardised potential trade should take into account the role played by dynamics as moving from static OLS linear equation to dynamic linear system with fixed effects (GMM) the fit of the regression improves (De Benedictis and Vicarelli, 2003).

This criticism undermines most of the previous analyses and policy conclusions on the under-trading or over-trading of countries or areas carried out based on coefficients obtained from cross-section estimates. As shown above (see table 1), apart from Baldwin, (1994) early empirical studies used cross-section data to estimate a gravity model.

The method of estimation has also been objected. The fixed effects model (FEM) is consistent (in absence of endogeneity and errors in variables) while the REM has the advantage of more efficiency as compared to the FEM but it is only consistent if the orthogonality conditions are fulfilled, which is not the case in gravity analysis. A random effect model would be affected by the problem of correlation of the explanatory variables with the unobserved effects because the omitted variables are specific to cross-sectional units (export and import effects) or to time periods as they derive from tariff or non-tariff barriers (tariffs, taxes, duties, bureaucratic and legal requirements, etc.) and from export driving or impeding 'environmental' variables (size of country, access to transnational infrastructure networks, geographical, political and historical determinants e.g. the relatively important role of trade relations between the CEECs because of former membership in COMECON) which are not random but are deterministically linked to the countries specific characteristics (Hsiao, 1995; Egger, 2002)⁸.

⁸ Egger (2000) gives strong support to the FEM but in a following article (Egger, 2002) argues that the best method is an AR(1) Hausman and Taylor estimator which would allow correcting for autocorrelation when time is also a dimension of the panel. See also Baldwin (1994) and Matyas (1997, 1998) for a description of further advantages of this methodology. But an opposite view is expressed by Christie (2002) which criticises FEM estimation and opts for pooled cross-section so to have only time effects as introducing individual effects would

Some criticism was risen by Egger (2002) also regarding the approach followed to estimate the potential. Two strategies have been adopted in order to calculate the trade potential. The first derives *in-sample* trade potential estimates, i.e. referring to the EU-CEECs literature, CEECs are included in the regression analysis and the difference between observed and predicted values are considered as the difference between potential and actual bilateral trade relations. This procedure was adopted in most cases. The second strategy derives *out-of-sample* trade potential estimates, i.e. the parameters for EU (or OECD) countries are estimated by a gravity model which do not include the CEECs and then the same coefficients are applied to project "natural" trade relations between EU or OECD countries and the CEECs. This strategy was only followed by Wang and Winters (1991), Hamilton and Winters (1992), Baldwin (1994), Brulhart and Kelly (1999), and by this study (see tab.1). The second method has to be preferred as the first one can only be pursued if there is misspecification of the trade model as according to the economic theory in the case of proper specification (i.e. consistent and efficient) estimators should exhibit white-noise residuals and should not identify large systematic differences between observed and in-sample predicted values among country groups. Therefore, if an estimator reveals large systematic differences between observed and in-sample predicted values this should be interpreted as an indication of misspecification and parameter inconsistency (Egger, 2002).

Our methodology

With respect to the literature surveyed above, one of the novelties of our contribution lies in the adoption of a panel data analysis combined with an "out-of-sample" method of calculation of potential trade. We applied a panel estimate over 1995-2002. The adoption of panel analysis follows Baldwin (1994) and more recent contributions (Mátyàs, 1997, 1998; Egger, 2000, 2002, 2003; De Benedictis and Vicarelli, 2003). However, Baldwin uses data for a period before the transition process started but data on the CEECs' gross national product are unreliable before the change in regime in 1989 while the use of more recent data of better quality provides a more accurate picture of potential and actual trade. Mátyàs do not calculate potential trade, Egger (2002) and De Benedictis and Vicarelli (2003) use panel analysis and calculate potential trade but they adopt an in-sample methodology for the calculation of the

miss the point of the gravity model. Besides, a fixed effect estimator, including in a constant term all the country-specific characteristics, avoids misspecification problems due to omitted variables.

potential/actual ratio. We follow the out-of- sample methodology: we estimate the parameters of a gravity panel model for intra-EU trade and then plug them into the regression of trade between 11 MED countries and their main European trade partners (Italy, Germany, France, UK, and Spain). In this way we obtain potential trade between EU and MED over 1995-2002. This potential or normal trade is then compared to data flows observed to assess the dimension of trade potential not exploited in the medium run. Finally, we compare the results obtained for the MEDs with those obtained by applying a similar methodology to the CEECs, to investigate whether the differences in trade agreements have induced a different exploitation of the trade potential.

The choice of out of sample estimates of the trade potential was motivated by the consideration that this approach is more appropriate in the early stage of transformation. i.e. in the case of the Mediterranean countries which are far from being integrated with EU while for the CEECs out-of.sample predictions maybe it is less appropriate. However, the in-sample approach to the prediction of trade potentials is inappropriate because if the underlying model is consistent there should be no systematic difference between observed and in-sample predicated trade flows⁹.

3. The gravity equation framework

The gravity equation, borrows its name from the Newton gravity law in mechanics, which says that the attraction between two countries is directly correlated with the product of their mass and inversely correlated with the square of the distance between their respective centres of gravity.

In economic terms, bilateral trade between two countries is explained on the basis of the product of the dimension of the GDP of the two partners, i.e. of the reciprocal mass which produces an attraction force, and of the geographical distance, which approximates trade costs and has a negative effect on trade. The gravity model is a single equation model that considers GDP to be exogenous so there is no scope for export-led growth. This standard model is generally enriched with additional variables such as institutional, political, historical variables,

⁹ Besides, the practice of pooling data for industrial and developing countries creates heterogeneity problems. While this maximizes degrees of freedom, the relationship between trade and economic characteristics may vary between the two groups of countries. The income elasticity of trade may be different at high and low levels of income or for different types of goods, for example. Transaction costs may have very different structures in countries with more and less articulated markets. Results based on heterogeneous cross sections may therefore suffer from subsample instability and heteroskedasticity. (Bayomi and Eichengreen, 1995).

able to impact significantly on bilateral trade (common language, presence of a common border, preferential trade agreements)¹⁰.

Among the different specification adopted in the literature (see tab. 1) we chose the following one (which showed the lowest value of the variance inflationary test for multicollinearity)¹¹ and applied it to intra-EU trade. We consider only 13 EU countries in the empirical analysis, since for Belgium and Luxembourg data were missing for some years.

$$X_{ijt} = \alpha_t + \beta_1 \text{POP}_{it} + \beta_2 \text{GDPPC}_{it} + \beta_3 \text{POP}_{jt} + \beta_4 \text{GDPPC}_{jt} + \beta_5 \text{DIST}_{ij} + \beta_6 \text{BORDER}_{ij} + \beta_7 \text{Commlang}_{ij} + \beta_{10} \text{FTA} + \varepsilon_{ijt} \quad (1)$$

where: i are the countries of origin, j the destination countries, $t = 1995-2002$ the period under examination; X_{ij} are exports of country i to country j in real terms; α_t is the bilateral constant; POP_{it} and POP_{jt} are the populations of country i and j respectively at time t ; GDPPC_{it} and GDPPC_{jt} are per capita GDP of country i and j at time t in real terms; D_{ij} is the geographical distance in Km between the capital of country i and of country j ; BORDER is the dummy that takes value 1 if the two countries share a common border and/or have ex-colony links and 0 otherwise. Commlang is the dummy for common language which takes value 1 if they speak the same language and 0 otherwise. ε_{ijt} is the error, normally distributed with mean 0 and variance σ_ε^2 . All the variables in our equation, except for the dummies, are in logs and therefore the estimated parameters are elasticities, namely percentage variations in bilateral trade as a result of percentage variations in the explanatory variables.

Following the indication of the theoretical and empirical literature on the determinants of trade we expect bilateral exports to be positively influenced by:

a) the importer demand and exporter supply as proxied by their population and per capita income (per capita POP and GDP). A higher per capita income means a higher import demand and export supply as it is a proxy of the economic development of the country. Trade grows more than proportionally as the economy gets richer: demand for variety grows with income

¹⁰ In the econometric analysis, if trade is between partners with different levels of development further variables are generally added: country risk, degree of economic freedom, capital controls, multiple trade regimes, degree of capitalisation of firm through the stock market, credit to the private sector (Mátyás, 1997).

¹¹ We check the robustness of our results using total GDP as a measure of the mass of the partners. The main results did not change. Total income variables were not used because they would have created problems of multicollinearity due to the strong correlation between absolute GDP and population. By applying this specification we expect coefficients of population variables to be positive as they include the effects usually attributed to absolute GDP variables.

and leads to a higher share of intra-industry trade in similar goods as scale economies favour specialisation in differentiated goods (Helpmann and Krugman, 1985). The effect of population is more ambiguous: a larger population means a large domestic market, a higher degree of self-sufficiency and less need to trade. At the same time a large population entails a deeper labour division and scale economies in production which are generally associated in the theoretical models with a larger need of trading. Therefore, the effects of this variable are ambivalent (Nillson, 2000).

b) the dummies sharing a land or a sea border, ex-colony links, common language, which capture the geographical closeness, the better information, the lower cultural differences, the lower “home bias”, and research and communication costs associated with proximity (familiarity with custom regime, institutions, legal system) (Disdier and Head, 2003);

c) the presence of trade agreements.

Conversely, bilateral exports are negatively influenced by:

d) the variable distance or surface of host’s market, i.e. geographical distance, proxy of trade costs, “home bias” and time and search costs.

A careful consideration deserves the relationship between the constant term and the coefficient of the distance variable. According to Feenstra *et al* (2001, p. 432) the constant catches the average value of exports of the sample and therefore mirrors the world income. Therefore, the gravity equation is nothing else but a simplification of several trade models. In all theoretical models we can think that bilateral trade relations with respect to a single good are a share of the total consumption of that good in the importing country as a share of the global production: $exp_{ij} = I_j/I_w$, where I_j is the consumption/production of that good from country j and I_w is the global production. Now, if we consider all trade relationships between country i and j , we get $exp_{ij} = (I_i * I_j) / I_w$. In logs: $ln(exp_{ij}) = -ln(I_w) + ln(I_i) + ln(I_j)$. Therefore, *the constant should be negative and should represent the impact of world income on bilateral trade within the sample.*

Buch et al. (2004) argue that the constant term includes many different factors, including the average distance among the countries in the sample, the specific characteristics of the countries and all the omitted variables. Holding constant all the other factors, the constant is also considered a measure of the impact of the distance. If the constant increases it means that the transport costs are getting less and less important for all. In fact, they argue that the effects of increasing globalisation are caught in the gravity framework not by a reduction in the coefficient for distance, but rather by changes in the constant term.

The source of these variables are shown in table 2.

We have compared the different estimation results for different panel estimators (between, fixed effects panel model, random effect panel model, FEM AR1, REM AR1) in table 3.

First, we estimated the cross-section equations by an OLS estimator averaging data for the periods 1995—02 (model 1 in table 3). The Huber/White/sandwich estimator of variance is used to correct for heteroskedasticity.

Then we introduced fixed effects, i.e. a different intercept for each couple of countries (model 2 in table 3). In this way, all the time invariant terms (borders and distance) are dropped and included in the bilateral constant terms as in the following equation:¹²

$$X_{ijt} = \alpha_i + \beta_1 \text{POP}_{it} + \beta_2 \text{GDPPC}_{it} + \beta_3 \text{POP}_{jt} + \beta_4 \text{GDPPC}_{jt} + \beta_5 \text{DIST}_{ij} + \beta_6 \text{BORDER}_{ij} + \beta_7 \text{Commlang}_{ij} + \beta_{10} \text{FTA} + v_{ijt} \quad (2)$$

$$v_{ijt} = v_i + \varepsilon_{ijt}$$

where v_i are unobserved bilateral country-level effects and ε_{ijt} is the error term.

Finally, we estimated a Random Effect Model (REM) (model 3) which is expressed by the following equation:

$$(y_{it} - \mathcal{G}\bar{y}_i) = (1 - \mathcal{G})\alpha + (x_{it} - \mathcal{G}\bar{x}_i)\beta + \{(1 - \mathcal{G})v_i + (\varepsilon_{it} - \mathcal{G}\bar{\varepsilon}_i)\} \quad (3)$$

This model differs from the FEM as, in spite of considering an intercept for each couple of countries, assumes that it is random and not fixed.

The models (1), (2) and (3) do not include country or year dummies. The following models in column (4), (5), (6) of the table add to the general specification of the gravity equation dummies for the years and for the exporting countries. The models (7), (8) and (9) include dummies for exporting country, for importing country and for years. However, the between estimator, which is an OLS estimate on the average values of the variables does not include the year dummies. The between-estimator does include the countries' dummies, though. The FEM is a within estimator and estimates by OLS the difference between the variables and their mean value. Therefore, it does not include the countries' dummies, which are excluded since they are like fixed effects and are removed in estimates at the difference.

One of the problems with the FEM, is that it does not consider possible autocorrelation of residuals. A possible alternative we tried was to estimate the FEM with AR(1) (column 10 in table 3). The results of estimates of REM with AR(1) disturbances are also provided in the columns (11).

3.1. *The results*

We had to make a choice among different models. None of them is safe from criticism and problems, as the econometric literature on this topic widely shows. As anticipated, there are problems with the FEM which is affected by autocorrelation of the residuals.

The preferred specification is a REM with exporting and importing countries' and years' dummies, namely model 9. The Hausmann test of equality of common coefficients between the FEM and the REM cannot reject the H_0 . This result is partly due to the similarity of the coefficients for the year dummies, but also mirrors the tendency of the coefficients of the REM to become closer to those of the FEM, when including dummies for exporting and importing countries. These dummies seem to be able to clean the estimates of most of the fixed effects. Inspection of the R^2 also suggests this conclusion, with the R^2 -within of the REM model tending to that of the FEM, after inclusion of the country dummies. This suggests that the REM model has consistent coefficients like the FEM, while being more efficient. Another advantage of the REM is that it provides an estimate for the distance variable, which is an essential component of the gravity equation. The biggest difference when comparing the models (8) and (9) come from the coefficients of the population variables. The coefficient for the population of the exporting country in the FEM is double than in the REM, while the coefficient of the population of the importing country is almost zero in the FEM and equal to one and statistically significant in the REM. Most likely, the insignificance of the coefficient of the population of the importing country in the FEM has to be attributed to the role of the time invariant factors. Removing such factors might make the population variable statistically not significant.

In the preferred specification the results are in favour of the hypotheses underlying the traditional gravity model: all the variables have the expected sign and are significant at 1%. The explanatory power of the model is also high. The significance of distance in explaining the trade intensity between MED and EU suggests that transport costs still have an important impact on the export performance.

Also the value of the coefficients are reasonable. Similar to other specifications, the coefficient for the per capita GDP of the exporting country is lower than that of the importing country. This is to be expected, considering that exports are more related to the income level of the importing, rather than of the exporting country. The coefficient for the distance variable is

¹² The estimator removes the fixed effects by subtracting the time average for each variable for each country and then applying the least square on these transformed variables.

stable across different specifications, suggesting that it is not affected by other variables included in the specification.

The parameters adopted for trade potential computations were taken from the coefficients of the REM model.

Before introducing the estimate of the trade potential it is useful to remark that no matter the methodology adopted a shared view in the literature is that while gravity models have strong power in explaining trade patterns between countries they are extremely unreliable as an attempt to obtain a punctual estimate of the trade level, because of the sensitivity of the estimated coefficients to valuation errors. Especially the estimation accuracy of the constant term can have a strong influence on the predicted level of trade flows. Therefore, the prediction accuracy for trade flows in absolute terms is rather low and we should take the following calculation as an indication of the presence of negative or positive gaps of a certain intensity but not as precise measures of them.

4. Estimate of EU-MED and EU-CEECs trade potential with EU-5 and comparison with effective trade.

To check whether trade between EU and MED approached its potential level in the period under consideration, we apply the estimated coefficients from the gravity equation of intra-UE trade to the same specification for EU-MED trade flows, following an out-of-sample methodology. These parameters are used as a “benchmark” to estimate the potential integration that MEDs might obtain if trade elasticities with respect to socio-economic and geographic variables would be the same as those observed in intra-EU trade. Trade volume so obtained is considered “normal” trade which could be obtained with a deeper integration according to the predictions of the gravity model. We applied the same procedure to EU-CEE trade.

This kind of methodology (the projection of trade relations for groups of countries different with respect to those for which the parameters have been estimated) allows to observe integration process at different speeds for different countries and eventually regions in each area and indirectly provides an assessment of the relative success of the Europe Agreements versus the Mediterranean Agreements.

Before starting our discussion about the trade potential, we will consider the recent evolution of trade patterns among the considered countries.

4.1. The recent evolution of trade patterns

Figures on MED-EU trade show that for most MED countries trade with EU is a remarkable share as a result of geographical proximity and of complementarity of the production structures. On the contrary, intra-regional integration and integration with the rest of the world is low. However, trade relations with the EU have two negative features.

First of all, they are quite *asymmetric*: on average in 2002 while trade with the EU represented about 45% of their total trade (for Maghreb, it is 70% for exports and 60% for imports), as far as EU is concerned, trade with the countries of the Euro-Mediterranean partnership was only 3%. Asymmetric is also the structure of trade, with EU export much more developed than imports from MEDs while the opposite is observed for MEDs which are much more dependent from EU and have structural negative trade balances.

Also the CEECs are afflicted by asymmetric trade with the EU but to a much less extent than the MED area. In 2003 exports to CEECs as a share of total EU exports had become more than 12% from only 5% in 1990 and for the imports the share was above 10%¹³.

A second feature of MED-CEECs trade relationships is the high level of concentration on both sides. The countries with high trade intensity are Malta, Turkey and the Maghreb countries¹⁴ while the Mashrek countries are more oriented towards the USA and the Gulf countries. Also among EU exporters to MED the most important trade partners, namely France, Germany, Spain and Italy, together represent 70% of total EU-MED exports and imports thanks to historical and geographical links (access to the Mediterranean).

As a result also trade growth was distributed asymmetrically showing wide gaps across countries: for instance EU exports scored a high increase in Turkey (81%), and Algeria (71%) but in Lebanon they increased by only 20%. As for imports, the increase was in general much lower and mostly took place with Turkey whose imports increased by 138% (imports from Cyprus have even decreased) (Eurostat, 2003). Among EU partners Spain is the one which has benefited the most from trade intensification with an increase in exports equal to 92% (while it was 60% for France and UK, 46% for Italy and 42% for Germany). France, Germany and Italy have increased their imports by about 12% and Spain by 7%.

Overall, MED exports to the EU have only increased by a factor of around 1.4, a much slower rate than other regions, most notably the Central and the Eastern Europe countries whose exports to the EU grew by a factor of more than 5.

¹³ The average share of exports and imports that CEECs devote to EU is more than 60 and 55% respectively.

¹⁴ Maghreb countries which we consider are Morocco, Algeria and Tunisia (we exclude Libya and Mauritania); Mashrek countries include Lebanon, Syria, Jordan and Egypt.

In few years exports to the EU as a share of total exports have become on average more than 60% of CEECs total exports (according to Eurostat they range from a minimum of 48% for Lithuania to a maximum of 70% for Poland with some impressive increases over the period 1990-2003 from 4 to 70% in the case of Estonia, from 6 to 55% in the case of Bulgaria from 5 to 48% in the case of Lithuania). The average share was only 30% in 1990. Imports are on average more than 55%, starting from an average of 32% in 1990, with some peaks like Poland and Czech Republic, with more than 60%, followed by Romania with 57%.

4.2. Estimating the trade potential

The graph 1-10 contain the trends in the trade ratio between potential trade (i.e. the “normal” trade estimated in the way described above) and effective trade among each EU country and each country in the two areas (MEDs and CEECs) over the period 1995-02. A ratio of one suggests that potential trade equals real trade. The higher is the ratio, the higher is the gap which has to be filled and therefore the possibility to create new trade. A decreasing (increasing) trend of this ratio over time suggests that trade is increasing (decreasing) and tends to approach its potential level.

The following observations can be made.

1) The ratio between potential and real trade with the MEDs is generally showing a constant trend or even an increasing one between 1995 and 2002. The main exceptions are Tunisia and Turkey (where it is weakly decreasing). This suggests that exports between each EU country and the MEDs has further increased the distance with respect to the normal or the “potential” trade that they might have reached given the economic, cultural and geographic conditions. Trade potential between EU and MEDs is far from being exploited in 2002: the ratio is much higher than 1 (values are above 4 for exports and imports).

2) Conversely, the opposite is observed with respect to the CEECs which show a trend marked by a large decline: they start from a ratio much lower than the MEDs (around 2) and in the same span of time further close the gap (especially in the case of countries which started from the worst positions such as the Baltic Republics and Bulgaria, which show the most dynamic trend). the trade potential between EU and CEECs is quite close to be exploited in 2002: the ratio is quite close to 1 in the case of the CEECs (for instance in the case of Italy is

between 2.2 and 2.6 for exports and 1.7 and 2.4 for imports). This suggests a tendency to close the gap.

3) The intensity of EU imports from the MEDs is on average lower than the intensity of exports, while the opposite is observed in trade with the CEECs. This result is consistent with those analyses which have stressed the fact that while the MEDs still have to face many barriers to entry in EU markets, the CEECs with the Europe agreements have benefited of a total and preferential opening for their export to the EU.

For the individual EU partners the following features are observed. French are much closer to their potential with Algeria, Malta, Morocco and Tunisia, while in trade with Mashrek countries flows are much below what the model predicts. Germany has excellent trade relations with Turkey but with the other countries it is substantially below trade flows predicted on the basis of the gravity model. Spain is closer to the predicted potential with Tunisia, Turkey and Morocco. The United Kingdom exploits its trade potential more intensely with Israel, Malta, Cyprus and Turkey. Finally, compared to the other four partners, Italy has a trade structure spread more evenly across all MEDs. If we compare the single MEDs we observe that all the countries are in a similar position although with Malta, Israel, Tunisia, Algeria, there is a better achievement both in imports and in exports (ratio round 4). The underachievement with respect to the model predictions is higher with Cyprus, Jordan and Lebanon, especially as far as imports are concerned.

While as far as the MEDs are considered, we converge with previous studies which also found a large “under trading” between EU and MEDs (Rose, 2002; IMF, 2002), the most striking aspect of our results is that we find that the trade potential is still not exhausted also in the case of trade with the CEECs in contrast with a wide literature on the CEECs achievement of their trade potential with the EU (see Tab.1 and section 2). However, we found similar results to those from Baldwin.

In a recent analysis, Bertolini and Montanari (2002) also applied an out-of-sample method to EU-CEECs trade potential gap as we did but they found much lower coefficients of the ratio. However, they deploy a cross-section analysis which might explain such different result as the cross-section tends to underestimate the coefficients.

Besides, we deem that the difference of our results could also be explained in the light of the period considered in the previous studies. For instance Gros et Gonciarz (1996) suggest that the trade potential had been already reached in 1992. But we may notice that they base their analysis on a very negative period for the CEECs, 1992, unlike Baldwin which considered the

pre-transition much higher level of income and which obtained results quite similar to ours. In the first half of the 90s the CEECs were in the descending part of the J curve of transition. The GDP was much lower than the current income of these countries suggesting that potential had already been exploited. Actually, as shown by figures in tab. 4, the GDP growth has been massive over the last decade in most CEECs. According to the EBRD, in 2001 all the countries except Bulgaria, Romania and the Baltic Republics had reached the 1989 level of income. But 1989 was just the year considered in Baldwin for the GDP of eastern economies. Poland and Slovenia overcame the 1989 level of GDP already in 1997. Therefore, the GDP in all the CEECs almost doubled between 1992 and 2002, increasing the trade potential on the one side, and decreasing it but less quickly on the other (due to the increasing integration which translate into a progressive reduction in the potential and a trend towards convergence with effective trade).

Our results are quite robust to different estimation methods. The ratio obtained applying the FEM and the REM only differs in terms of level but not in terms of trends and ranking of the countries level of integration. The kind of prediction, robust to different models, is a sort of test for the conclusion achieved and for the goodness of fit of the method of estimate and of the estimator adopted: a high trade potential with MEDs not yet exploited is predicted with all the different types of methods which means that the prediction is stable and robust.

5. Conclusions

The results of our gravity analysis confirm that there is still a large trade potential between EU and MED which is not yet exploited on both sides. Most of the countries of the Euro-Mediterranean partnership have a high degree of openness with respect to the EU. However, the gap between potential and real trade with MEDs is generally showing a constant trend or even an increasing one between 1995 and 2002 (values are above 4 both for exports and imports). This suggests that bilateral relations between EU country and MED have further increased their distance with respect to normal or “potential” trade predicted by a gravity model, which is the level of trade they might have reached given the economic, cultural and geographic conditions.

Besides the trend was negative over the last twenty years: they had a much more developed trade with the EU between 1980 and 1984, while they have cumulated a wide and increasing gap with respect to their potential in the following period. This trend underlines that the intensification of trade after the Agreements signed in 1995 was quite poor and the importance of deepening bilateral and multilateral forms of integration.

A different conclusion is reached regarding EU trade with respect to the CEECs, which show a trend marked by a large decline in the gap: they start from a ratio much lower than the MEDs (between 1 and 2) and in the same span of time further close the gap (especially in the case of countries which started from the worst positions such as the Baltic Republics and Bulgaria which show the most dynamic trend).

However, the conclusion we reach is that there is a large trade potential not only in trade with the MEDs but also with the CEECs. Our predictions for the CEECs look quite different from the rest of the literature except from Baldwin estimates.. We deem that this depends on having used a panel analysis and a different period .

Some caution needs to be applied to the interpretation of our results. Some main limitations have to be borne in mind. First, our methodology does not disaggregate trade flows by sectors. This is of particular importance for agricultural trade, which accounts for a substantial proportion of EU-CEEC trade, and to which the gravity model is not as well suited as to trade in manufactured goods. The scope for sectoral disaggregation in future work is evident. Besides our study is restricted to trade, and thereby does not cover some central items on the agenda of integration with MED and CEECs such as their relative development as a destination for foreign investment.

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Tab. 1 - Summary of the literature on potential trade based on gravity analysis applied to CEE and to MED countries (chronological order).

Authors	Sample and data	Period	Method	Specification	Impact of GDP on trade	Impact of per capita gdp on trade	Impact of population on trade	Role of Distance (transaction and transport costs) on trade	ROLE of FTA, proximity, language, ex-colony links on trade	potential/actual: method	potential/actual: results
CEE											
<i>Wang and Winters, 1991</i>	76 integrated economies (non CEECs); Summers-Heston estimates of the CEECs' GDP in 1985; rail, road and marine distances; role of adjacency and mutual membership in preferential trade areas;	average 1984-86	cross section log-linear estimate	bilateral trade flows on GDP, population, distance, membership in preferential trade areas	Positive and strong: both exports and imports grow at almost the same rate as income	-	negative and mild	negative and strong	positive and significant	out-of-sample projection approach: use a gravity on data that do not include the CEECs to estimate the bilateral trade flows in a "normal" country, i.e. integrated into the world trade. Then CEECs GDP, population and distance are inserted into the equation with the data for trade with the 76 countries in the sample generating an import and export pattern for each CEEC with each of the 76 countries	East-East trade too large in 1985 while East-West trade only a fraction of what would have been in an integrated Europe
<i>Hamilton and Winters, 1992</i>	76 countries (19 industrial and 57 LDCs) (about 80% of total world trade); trade data: total merchandise imports from IMF-DOTS, GDP and population from WB-WDI, distance: the shortest navigable distance between countries' main ports plus the overland distance from the ports to the economic centres of the countries.	average 1984-86 for GNP and imports, population for 1985	cross section log-linear estimate	in log: total merchandise imports (\$ USmn) on GNP, population, distance, adjacency, trade preferences	positive and strong: both exports and imports grow at almost the same rate as income	-	negative and mild	negative and strong	common border positive role, trade preferences (ex-colonial links, economic integration schemes, EU preferences, unilateral preferences) reduces trade costs but hard to detect (cooperation is not a guarantee for stimulating trade maybe because of restrictions in trade arrangements between developed and developing)	out-of-sample projection approach: use a gravity model on trading patterns of a large sample of market economies and assumes that SUEE will follow the same pattern	trade within SUEE static or falling, while with Western Europe could increase up to fivefold; also western EU trade with the SUEE will increase very significantly especially with Germany (up to 24%), UK less (14%); also US export and imports would rise by 20 and 11%
<i>Baldwin, 1994</i>	17 (EC and EFTA) exporting countries and 20 partners: trade flows among them and between these nations and the USA, Japan, Canada, Turkey, Belgium and Luxembourg; bilateral trade flows taken from the UN's Comtrade database in nominal dollars converted to real dollars by using the prices indices published by Eurostat in Commerce Extérieur 1992 yearbook, GDP and population data taken from the Summers and Heston (1998) database at PPP and at 1985 international dollars; for Eastern GDP data are for 1989 from Planecon; distance is measured by straight-line distances between capitals	1979-88	panel: random effects estimator with maximum likelihood correction for first-order autocorrelation	in log: exports from i to j on per capita gdp, population, distance, dummy EU EFTA	-	positive and significant	positive and significant	negative and significant	positive and significant	Out-of-sample with two scenarios: one estimates the model on data for Western European nations with the aim to project how trade will flow in Europe when the East becomes as integrated as the current West European nations are today with income constant at their 1989 levels; the second scenario is long run with per capita incomes of the CEECs and former Soviet Union catching up to the level of the poorer West European nations.	Potential exports and imports EU12-CEE two times actual exports and imports of 1989: imports should increase rapidly over the medium term; the poor four (Spain, Portugal, Greece, Ireland) expand more than the EU-12 average; exports of CEECs also have ratios from 1.2 to 5.2, while for intra-CEECs trade all ratios of potential to actual less than unity (trade diverting effect of the ex-CMEA)

<i>Brenton and Kendall (1994)</i>	East-West trade and East-East trade: export data for 25 countries including 6 former European CMEA;	1992	cross section log-linear estimate	GDP, population, distance, adjacency, dummies: EU/EFTA, CEE, EU11/CEE, Germany/CEE	positive and statistically significant: close to 1 (100% increase)	-	negative, statistically significant and smaller than 0,25 (25% increase)	negative, statistically significant and higher than 0,5 (50% increase)	-	in sample: use the gravity equation on trade relations of a sample containing Western and also former CMEA and then use dummy variables reflecting the relations between Eastern and Western European countries and also among CEE countries to measure deviation from "normal" trade relations.	already in 1992 trade between EU members and CEE countries was about 25% larger than one would expect on the basis of distance and income; also trade between CEE countries is almost 4 times higher than on the basis of the standard gravity relationship (no hub-and-spoke system problem)
<i>Gros and Gonciarz, 1996;</i>	EU12, EU15, CEE3 (advanced transition economies: Czech and Slovak R., Hungary, Poland); actual 1992 data in the prices of 1992 (compared to 1989 data expressed in 1985 prices as in Baldwin); per capita GDP from OECD and WB;	1992	takes the parameters from Baldwin estimate		-	-	-	-	-	makes a correction to the Baldwin estimates considering that the GDP was overvalued because of using pre-transition data (per capita GDP used by Baldwin is 2 to 3 times higher than the actual 1992 data for CEE); downward revision of Baldwin projections of CEEC-EU trade combining the parameters from Baldwin (1994) with the actual 1992 data on GDP	adjustment completed: trade figures for 1992 show openness level which must be considered high compared to market economies: projections based on the data of 1992 does not indicate any remaining CEE trade potential with Western countries conversely actual trade is higher than potential indicating no need for special protection; the actual exports of the EU-12 in 1992 more than twice as large as estimated potential and the imports of EU-12 from CEE-3 also considerably higher than the potential); intra-CEE trade potential below one half of Baldwin potential and dramatically below actual
<i>Brenton and Di Mauro, 1999</i>	Bilateral distribution of exports and FDI for individual countries (Germany, France, UK, USA) on 35 destination countries OECD and non OECD; OECD International Direct Investment Statistics Yearbook, 1996 and EUROSTAT FDI data (EU Direct Investment Yearbook, 1996)	1992-95	pooled cross section log-linear estimate	GDP, population, distance, dummy adjacency and preferential relationship	positive and highly statistically significant	-	not statistically significant	negative and statistically significant	positive and statistically significant	dummy included in the regression equation to assess whether export flows to CEE countries are high or low relative to investment and exports to other countries in the world; separate dummy variables for CEEC3 (Hungary, Poland and Czech R.) and CEEC2 (Bulgaria and Romania) for the different speed of transition of the two groups.	the coefficients on the dummy variables for the CEEC3 not significantly different from zero except for USA; the actual EU exports to these countries do not deviate from their potential level; German and UK exports to Bulgaria and Romania is significantly below their normal or potential level
<i>Brulhart and Kelly, 1999;</i>	reference sample of 24 countries: 13 OECD members and 11 outward oriented developing countries; import data from IMF-DOTS, income data from WB-WDI at current market prices;	1994 (a year far from the start of transition)	cross section log-linear estimate	GDP, GDP per capita, distance (between the countries capital cities), remoteness (as the average of a country's distance to its trade partners weighted by the partners GDP), language, adjacency, EU dummy	expected sign and statistically significant at 1% confidence level	expected sign and statistically significant at 1% confidence level	-	expected sign and statistically significant at 1% confidence level	expected sign and statistically significant at 1% confidence level	out of sample: use a gravity on data that do not include the CEECs to estimate the bilateral trade flows in a "normal" country; forecast trade between Ireland and 5 negotiating accession countries (Czech R., Estonia, Hungary, Poland, Slovenia) based on the coefficient of a gravity equation on the reference sample of 24 countries; applies the parameters first for a "short-run" scenario, where incomes are held constant at 1994 levels, then for a "long-run" scenario, in which EU and CEEC per-capita incomes are assumed to have partially converged.	Irish exports to the CEECs are on average already close to predicted levels. The outliers are Hungary, where projected Irish exports are 69 per cent above actual levels, and Poland, where projected exports are 37 per cent below the actual value for 1994; Irish imports from the CEECs were below "normal" levels in all cases. For the CEEC-10 as a whole, predicted Irish imports are two-and-a-half times as large as actual imports.. Stronger potential for trade growth emerges in the "long-term" scenario, with partial income convergence of the EU and the CEECs: the value of Irish trade with the CEECs could reach 8.3 per cent of Irish GNP in 2020.

<i>Nilsson, 2000;</i>	trade among OECD countries, EU countries trade with CEECs and Cyprus, trade among the CEECs; UN Comtrade export data in nominal US 1000 \$ converted to constant US \$; data on income WB-WDI;	1995-96 average	cross section log-linear estimate	exports on gdp, per capita gdp, distance, binary variables for countries with a common border and for countries with a common or similar language, dummy for important trade agreements such as Nafta, EEA, AUNZ, EU-Turkey custom union	positive and highly significant	positive and highly significant both for exporter and importer but stronger for the former	-	strong impediment to trade: negative and highly significant	trade between the countries in the EU and EFTA (EEA) is greater than average OECD trade, not same for the NAFTA; average EU trade with the CEECs and Cyprus does not differ significantly from the average level of trade among the OECD countries (parameters are insignificant) with no difference between the group of the first entrants and the later entrants; but the variable for intra-CEE trade is significant which indicates that trade between the CEECs is greater than the average level of trade between the OECD countries	in-sample: trade between the OECD countries is defined as "normal" trade and to analyse whether EU trade with the CEECs and among the CEECs is above this "normal" level the EU countries trade with the CEECs countries and among the CEECs are added to the sample and binary variables for the EU countries' trade with the CEECs and for trade among the CEECs are included.	the gap between potential and actual trade between EU and the CEECs has been greatly reduced just 1.1 on average, and several EU countries export more to the CC than the gravity model predicts; they have also reached or exceeded their estimated potential of imports except for Austria, Portugal, France, Ireland, Spain, UK. Conversely, there is still some unused trade potential between the CC and the EU countries, but on average ratio in exports to EU is 0.9 (exceeded export potential) and only Cyprus, Czech and Slovak are above 1. High level of trade integration within CEECs as shown by the ratio potential actual trade and by the dummy for trade of EU with CEECs which is lower than the dummy for trade between CEECs.
<i>Bertolini and Montanari, 2001</i>	bilateral exports and imports between 14 EU countries and 32 partners: the EU members, the CEECs and other OECD industrialised countries. The study is sectoral (machinery, manufacturing and food and beverages). Data: for bilateral trade flows OECD ITCS real values million US \$ at 1995 constant prices; GDP and population from OECD Statistical Compendium and WB-WDI. Where data current prices and in local currency current exchange rate and price indexes for OECD statistical compendium; distance as straight-line distance between capitals.	1995-98 average	cross section log-linear estimate with White heteroskedasticity-consistent t-values	GDP, population, distance, dummy adjacency and common language, dummy for membership to the EU, dummy for membership of exporting country to EU and importing country to the CEECs, dummy for membership of exporting country to EU and importing to NAFTA.	-	positive and statistically significant	positive and statistically significant	negative and statistically significant	in machinery and statistically significant the dummy for language, the common border dummy is significant only in the export equation;	dummies are included in the regression equation to assess whether export flows to CEE countries are high or low relative to exports to other countries in the world;	the EU-CEECs dummy is positive and statistically significant for imports thus indicating that East-West flows of machinery are above "normal" values"; for manufacturing which includes textiles, iron and steel (sensitive products subject to a special regulation in the Europe Agreements), concerning EU imports EU-CEECs dummy is completely insignificant while it is negative and significant for EU exports which means that EU imports have reached normal values but exports can still exhibit a wide margin of growth (asymmetry favoured the CEECs).
<i>Bertolini and Montanari, 2002</i>	intra-EU14; bilateral trade flows IMF-DOTS million US \$ at 1995 constant prices; GDP and population from OECD Statistical Compendium and WB-WDI. Current exchange rate and price indexes OECD statistical compendium; distance as straight-line distance between capitals.	1995-99 average	cross section log-linear estimate	GDP, population, distance, dummy adjacency and common language	-	positive and statistically significant	positive and statistically significant	negative and statistically significant	positive and statistically significant	out-of-sample: gravity equation on trade flows between EU countries and application of the estimated parameters to trade flows between EU and CEECs	export potential of EU to CEE9 is not completely exploited the ratio potential /real trade is 1,54. The poorest countries within CEECs have the highest ratios. The CEECs can be divided into three groups: 1) Estonia, Hungary and Slovenia; 2) Poland and Czech R. ; 3) Latvia, Lithuania, Slovak R., Romania. Export potential of CEECs to EU lower than 1 (0,57) beyond the potential. The effect of asymmetric liberalisation of trade in the Association Agreements.

<i>Christie, 2002</i>	Trade between OECD and South East European countries (Romania, Bulgaria, Croatia, Bosnia, FR Yugoslavia, Macedonia, Albania) plus Slovenia, Hungary, Greece and Turkey. Data borrowed from Jarko and Jan Fidrmuc enhanced to include Albania, Bosnia Herzegovina and FR Yugoslavia, and observations for 1999. OECD data for GDPs, in billions of US dollars at current prices. Trade flows, measured as c.i.f. imports in millions of US dollars at current prices, from the IMF-DOTS. Distance matrix by Jarko Fidrmuc.	1996-99	pooled OLS cross-section estimation to have only time effects (individual effects would miss the point of the gravity model).	c.i.f. imports on gdp, distance, english language dummy for important trade agreements such as EU14, EU Association Agreements, CEFTA7, CIS, Baltic States, Baltic States-CIS and other dummies for intra-SEECs trade.	highly significant positive and of reasonable magnitude	-	-	highly significant negative and of reasonable magnitude	the effect of english language is strong; the dummies for western countries indicate significant effects for the EU and for the OECD, between EU members, between non EU members, between non-members and members; CEFTA and EU association agreements also significant.	dummies are included in the regression equation to assess whether export flows to SEE countries are high or low relative to exports to other countries in the world;	three groups: 1)former Yugoslavia,2) Albania 3) Romania and Bulgaria. Romania and Bulgaria were not involved in any of the conflicts in the region. They each have an EU association agreement, and they both trade at or above potential levels with the frontline EU countries. Albania is the least integrated country of the region. As for the countries of the former Yugoslavia, a combination of low GDP, high unemployment and past (or present in the case of Macedonia) military conflicts has caused trade levels to be highly distorted. Croatia and FR Yugoslavia trade little with each other, but they both trade massively with their corresponding entity in Bosnia. Simultaneously, they both have large future trade potentials with the EU.
<i>Egger, 2000</i>	Sample EU-14 (Belgium and Luxembourg together). Variables in constant prices and dollar (1990 base year). Bilateral exports from OECD, Statistics of Foreign Trade, GDP, Population, and Gross Fixed Capital Formation (GFCF) from OECD National Accounts. Export price indices from the OECD Economic Outlook and GDP deflators from the OECD and the WIFO database.	1985-96	OLS, FEM, REM to show the superiority of the panel framework vis a vis the cross-section approach. It allows to disentangle country-specific and time-specific effects. Proper specification in FEM: fixed country and time effects as the country effects are predetermined because of geographical, historical and political contexts.	An endowment based 2*2*2 model following Helpman and Krugman (1985) where one good is homogenous and the other is differentiated: the total volume of trade is the sum of inter and intra-industry trade volumes. Four regressors are adopted: difference in relative factor endowment; difference in relative size of the two countries in terms of GDP; overall economic space of the two countries given by relative size and factor endowments.	the coefficient of factor endowment distance between the two countries is positive and statistically significant only in the REM and OLS, not significant and negative in the FEM; size similarity statistically significant and positive only in the REM and the OLS; overall size always statistically significant and positive;	-	-	distance is always negative and significant	-	-	-

<p><i>Egger, 2002</i></p>	<p>U15 plus CEE3 (Poland, Hungary and Czech R.) trade with CEE10 (the new East European members plus Bulgaria and Romania); nominal exports are from OECD-SIT, IMF-DOTS, WIW. Nominal GDP from OECD Economic Outlook, IMF-IFS, WIW.; economic freedom variables from Economic Freedom of the World account for legal structure and property rights and international exchange.</p>	<p>1986-1997</p>	<p>Panel estimate: compares cross section, FEM, REM, Hausman and Taylor (1981), and since autocorrelation of the residuals is found also: First order autocorrelation AR(1) REM, First order autocorrelation AR(1) Hausman and Taylor.</p>	<p>Same as Egger 2000 plus exporter and importer viability of contracts and exporter and importer rule of law which influence the costs of international exchange since a higher level of contract viability reduces risk of bankruptcy and a higher level of rule of law reduces the probability of losing money. Bilateral exchange rate, distance, common borders and common language also added.</p>	<p>significant and positive the sum of GDP and the similarity in country size in all the models, while difference in relative factor endowment negative and significant in te REM; less robust the sign and significance of the other variables compared to Hausamn and Taylor estimation the REM underestimates the potential of the EU15 in the CEEC10 by about 49 per cent. OLS overvaluates it by 16%. Trade potential of the CEE3 in the CEEC10 overestimated by about 367 per cent with the REM and by about 76 with the OLS.</p>	<p>-</p>	<p>-</p>	<p>not significant n the Hausman Taylor estimation .</p>	<p>not significant common border and language in the Hausman Taylor estimation .</p>	<p>in-sample: projection of bilateral trade potentials of EU15 and 3 CEE in the CEE10. The exponent of minus one times the bilateral residual is interpreted as the bilateral trade potential. The excersise is carried out to show that the IN-SAMPLE METHOD is misleading.</p>	<p>compared to Hausamn and Taylor estimation which is the consistent aand efficient model never used bifore (giving white noise residuals) the REM underestimates the potential of the EU15 in the CEEC10 by about 49 per cent. OLS overvaluates it by 16%. Trade potential of the CEE3 in the CEEC10 overestimated by about 367 per cent with the REM and by about 76 with the OLS</p>
<p><i>De Benedictis and Vicarelli, 2003</i></p>	<p>11 EU countries and 32 importer countries (11 euro countries plus 21 other countries); exports in \$ current prices deflated by export deflators (EIU); GDP data in \$ at 1996 prices (EIU); distance taken from Haveman's database; trade agreements from WTO;</p>	<p>1991-2000</p>	<p>verifies the robustness of a common panel functional form to the change of estimators; three different estimators: static OLS linear equation, static linear equation with fixed effects, dynamic linear system with fixed effects (GMM)</p>	<p>standard functional form: GDP, distance, trade agreements, common land or sea border.</p>	<p>positive and significant</p>	<p>-</p>	<p>-</p>	<p>negative and statistically significant</p>	<p>positive and statistically significant</p>	<p>In-sample: compute the potential trade taking the ratio between real exports and fitted exports flows generated by the gravity equation. The index is standardised so that it would take values between -1 and 1; a positive index value shows a higher bilateral effective trade than the model predicts; negative values show the opposite.</p>	<p>Standardised potential trade varies with the change in the estimator used: moving from static OLS linear equation, to static linear equation with fixed effects and dynamic linear system with fixed effects (GMM) the fit of the regression improves. Index values show a clear path of convergence downward if the index is positive, upward if the value of SPT is negative. It also shows that the sign is not robust to the change in estimator. The indications of untapped trade potential should take into account the role played by dynamics.</p>

<i>MED</i>											
<i>Hassan Al-Atrash and T. Yousef, 2000</i>	65 countries bilateral trade: 18 arab countries and 43 other countries (over 90% of total Arab trade); US \$ export and import for 1995-97, IMF-DOTS, total GDP and per capita GDP of reporting and partner from World Economic Outlook;	1995-1997 average	Cross section maximum likelihood Tobit estimates to correct for the censoring of data at zero	export, import and total bilateral trade on GDP, GDP per capita, distance, free trade agreements (ASEAN, EU, GCC, AMU, Mashrek), common border, common language (English and French language), openness measured by the trade restrictiveness index, 3 dummies: the reporting country is an Arab country, if both the reporting country and the partner are Arab, if the reporting country is an Arab oil exporting country.	positive and significant at 5%	positive and significant at 5%	-	negative and significant at 5%	trade more with each others if share common border and english language; EU arrangements decrease trade; openness not significant	In-sample: binary variables for Maghreb (AMU), Gulf countries (GCC), Mashrek in order to examine whether trade between these and of these with ASEAN and EU, significantly differ from what the basic gravity model predicts.	Intra-Arab trade and Arab trade with most non-MENA countries are quite low in relation to what would be predicted on the basis of the gravity model. Mashrek exhibits higher levels of integration both within area and with the rest of the world with respect to Maghreb and Gulf countries. EU arrangements, GCC and AMU trading arrangements have not promoted greater integration among member countries.
<i>IMF, 2002</i>	131 industrial and developing countries bilateral trade from IMF-DOTS	1995-99 average	cross section log-linear estimate	conventional gravity model (trade on the nominal gdp, the distance, dummy for language and ex-colony links)	expected sign and significant	-	expected sign and significant	expected sign and significant	expected sign and significant	in-sample: the predicted values are based on the parameter estimates from the pooled gravity model of world trade: they are applied to trade of MENA, Asia, Africa Sub-Saharan, South America and Central America.	the degree of undertrading is large in the MENA and South Asia though this result does not take into account trade in services which have grown rapidly in South Asia (not considered in the gravity)
<i>Giovannetti et al., 2002</i>	cross trade of the six developed countries (France, Germany, Italy, Spain, United Kingdom and United States) with two groups of countries: all Mediterranean countries (labeled as MED) and the SEECs, estimated separately.	average 1993-98	cross section log-linear estimate	bilateral log of (1+export+import) (in nominal terms) on the nominal gdp, the distance, a dummy for language and ex-colony links	All the estimated coefficients have the expected sign and are significant (at the 5% level; except for the constant for the MED in two cases). The goodness of fit is acceptable for a cross-section analysis in the MED case, improves significantly when excluding the US and is always above 0,79 in the SEEC group.	-	-	The distance is always significant when both transforming it into log and excluding the US. Hence, the gravity model looks very robust and the distance variable is always an essential element of the estimation.	The language/ex-colony dummy is significant for both the MED countries and the SEECs. Its marginal contribution to the estimation is positive since the goodness of fit always increases when adding the dummy.	-	-

<p><i>Miniesy R.S., J.B. Nugent and T.M. Yousef, 2004;</i></p>	<p>186 countries; trade matrix data from Rose (2000) and from Feenstra <i>et al.</i> (1997), GDP at constant prices, distance, contiguity, common language, other transaction cost measures are from Rose (2000) on Penn World Tables (5.6) and from WDI.</p>	<p>1970, 1975, 1980, 1985, 1990 and 1992</p>	<p>OLS log linear pooled estimate</p>	<p>bilateral trade on GDP, per capita GDP, distance, common border, common language, free trade agreements, same nationality, common coloniser, ex-colony links, common currency, bilateral exchange rate volatility, estimated separately for total trade, for energy trade, for non energy trade between each combination of bilateral partners (among free trade agreements several: Nafta, Efta, Caricom, Asean, Sparteca, Patcra, Andean Group but no trade arrangements among MENA); the equation for energy trade much weaker than for non-energy trade</p>	<p>positive and highly significant, elasticity positive but less than unity</p>	<p>positive and highly significant; elasticity positive but less than unity</p>	<p>-</p>	<p>negative and significant both the variable distance (-1.09) and the transaction cost-increasing variable exchange rate variability</p>	<p>all positive and highly significant</p>	<p>in-sample: the predicted values are based on the parameter estimates from the pooled gravity model of world trade: they are applied to trade of each MENA country and to MENA as a whole in their trade with MENA 1 (Arab MENA), Iran and Turkey and with the Rest of the World for 1992 and actual to predicted trade ratio in % are obtained; Arab common market, the Gulf Cooperation Council, and the three dummy variables for sub-regional trading arrangements within MENA have virtually no effect on the parameter and have a negative and in some cases also significant coefficient.</p>	<p>In 1992 both intra-MENA and MENA trade with most non-MENA countries are quite low in relation to what would be predicted on the basis of the gravity model. There are strong "underachievers" in intra-MENAtade like Algeria, Egypt, Kuwait, Qatar, Sudan, Syria, all oil exporting countries while Jordan, Morocco, Oman, the UAE, Turkey are overachievers. In trade with other regions MENA is an underachievers especially with EU and Eastern Europe.</p>
<p>MED and CEECs</p>											
<p><i>this study: Ferragina, Giovannetti, Pastore, 2004</i></p>	<p>Bilateral exports (imports), in current dollars IMF, Direction of Trade Statistics; deflated by the export (and import) unit values IMF, International Financial Statistics. GDP in dollars at constant prices and exchange rates 1995, source WB-WDI. Population WB-WDI. Distance (straight line distance in km between the capitals) from www.wcrl.usda.gov/cec/Java.</p>	<p>1995-2002</p>	<p>six types of estimates: cross-section, pooled, fixed effects panel model, LSDV, random effect panel model, FEM AR (1)</p>	<p>exports in real terms regressed on the populations, per capita GDP, geographical distance, dummy for sharing a common border and/or having ex-colony links, dummy for common language.</p>	<p>-</p>	<p>positive and statistically significant</p>	<p>positive and statistically significant</p>	<p>negative and statistically significant</p>	<p>positive and statistically significant</p>	<p>out-of-sample: the predicted values are based on the parameter estimates from the pooled gravity model of intra-EU trade</p>	<p>The ratio between potential and real trade with the MEDs increasing between 1995 and 2002 with the exceptions of Tunisia and Turkey. The opposite observed with respect to the CEECs which further close the gap (from 2 to 1) in the same span of time (especially in the case of countries which started from the worst positions such as the Baltic Republics and Bulgaria, which show the most dynamic trend). But trade potential is still not exhausted also in the case of trade with CEECs.</p>

Tab. 2 – Data source for the empirical analysis

Variables	Source	Sample period
Bilateral export flows (current price, US\$ millions)	Direction of Trade Statistics, International Monetary Fund, 2003	1995-2002
Per capita GDP (US\$ at 1995 constant prices and exchange rates)	World Bank, World Development Indicators 2003	1995-2002
Population (in millions)	World Bank, World Development Indicators 2003	1995-2002
Distance (straight line distance in KM between capital cities)	www. wcrl.usda.gov/cec/Java	1995-2002
export (and import) unit values	International Financial Statistics, International Monetary Fund, 2003	1995-2002

Tab. 3 – Gravity model estimates (1995-2002)

	BEM (1)	FEM (2)	REM (3)	BEM (4)	FEM (5)	REM (6)	BEM (7)	FEM (8)	REM (9)	FEMAR1 (10)	REMAR1 (11)
Const	6.00 ^{***}	-6.75 ^{***}	-1.36	-18.27	-0.63	7.91 ^{***}	-20.81 ^{***}	0.63	3.88 ^{**}	0.02	5.39 ^{***}
Lgdpi	1.27 ^{***}	0.68 ^{***}	1.15 ^{***}	3.36 ^{***}	0.37 ^{***}	0.49 ^{***}	3.50 ^{***}	0.37 ^{***}	0.53 ^{***}	0.86 ^{***}	0.46 ^{***}
Lgdpij	0.41 ^{***}	1.59 ^{***}	1.10 ^{***}	0.44 ^{***}	1.27 ^{***}	0.76 ^{***}	0.43	1.27 ^{***}	1.06 ^{***}	1.39 ^{***}	0.99 ^{***}
Popi	0.82 ^{***}	2.01 ^{***}	0.84 ^{***}	1.10 ^{***}	2.03 ^{***}	1.01 ^{***}	1.12 ^{***}	2.03 ^{***}	1.01 ^{***}	-0.58	0.99 ^{***}
Popj	0.88 ^{***}	-0.02	0.91 ^{***}	0.88 ^{***}	0.00	0.89 ^{***}	1.04 ^{***}	0.00	1.04 ^{***}	0.43	1.05 ^{***}
Ldist	-0.78 ^{***}		-0.64 ^{***}	-0.67 ^{***}		-0.59 ^{***}	-0.60 ^{***}		-0.61 ^{***}	0.03	-0.62 ^{***}
Clg	0.24		0.26	0.08		0.08	0.12		0.08	0.03	0.08
Clb	0.15		0.17	0.36 ^{***}		0.36 ^{***}	0.48 ^{***}		0.47 ^{***}	0.08 ^{***}	0.46 ^{***}
Sd(u _i +e _i)	0.56			0.41			0.36				
Corr(u _i , XB)		-0.68	0		-0.68	0		-0.69	0	-0.43	
σ _u		1.88	0.56		1.88	0.41		1.88	0.36	1.80	0.32
σ _e		0.13	0.13		0.13	0.13		0.13	0.13	0.11	0.12
ρ (fraction of σ ² due to u _i)		1.00	0.95		1.00	0.91		1	0.89	1.00	
F (all u _i =0)		124.0 ^{***}			65.9 ^{***}			50.1 ^{***}		62.9 ^{***}	
RE of u _i			Gaussian			Gaussian			Gaussian		
θ			0.91			0.88			0.87		0.75
R ² -within	0.59	0.64	0.63	0.56	0.67	0.66	0.56	0.67	0.67	0.27	0.67
R ² -between	0.89	0.31	0.87	0.94	0.30	0.94	0.96	0.30	0.95	0.01	0.96
R ² -overall	0.88	0.31	0.86	0.93	0.30	0.93	0.95	0.30	0.95	0.01	0.95
F (all coeffs)	166.6 ^{***}	414.3 ^{***}	2635 ^{***}	136.5 ^{***}	187.7 ^{***}	4031 ^{***}	111.1 ^{***}	187.7 ^{***}	4752.9 ^{***}	31.2 ^{***}	4585.8 ^{***}
Hausman test		76.9 ^{***}			28.63 ^{***}			4.85			
Breusch and Pagan Lagrange Multiplier test for RE			2846 ^{***}			2567.1 ^{***}			2359.2 ^{***}		
Nobs	1085	1085	1085	1085	1085	1085	1085	1085	1085	930	1085
N. of groups	155	155	155	155	155	155	155	155	155	155	155
Obs per group	7	7	7	7	7	7	7	7	7	6	7

Notes:

a) *** denotes a 1% significance level; ** denotes a 5% significance level and * denotes a 10% significance level. No stars means not significant.

b) The R² have a panel meaning and cannot be interpreted exactly like the OLS R². Two properties of this last are missed in the panel R². This last does not represent the squared correlation between the fitted and actual value and is not equal to the fraction of the variation in the dependent variable explained by the variation of the fitted value. In other words, they do not denote the fraction of variance of the dependent variable explained by the variance of the estimated variable. The R²-within, the R²-between and the R²-overall represent the within, between and overall interpretation of the estimated model.

- c) The models (1), (2) and (3) do not include country or year dummies. The models (4), (5) and (6) include year dummies as well as dummies for the exporting country. The models (7), (8) and (9) include dummies for exporting country, for importing country and for years. The coefficients of these dummies are not reported.
- d) Notice that in the REM the $\text{Corr}(u_i, \mathbf{X}\mathbf{B})$ is assumed to be zero.
- e) The Breusch and Pagan test for random effects is a Lagrange Multiplier test on the $H_0: \sigma_{u_i}^2 = 0$. Rejecting this hypothesis suggests that the REM model is appropriate.
- f) H_0 for the Hausman test is that all the common coefficients between the FEM and the REM are not statistically different.
- g) θ represents the estimated value in the following random effect model: $(y_{it} - \bar{y}_i) = (1 - \rho)\alpha + (x_{it} - \bar{x}_i)\beta + \{(1 - \rho)v_i + (\varepsilon_{it} - \rho\bar{\varepsilon}_i)\}$, where x_{it} is the matrix of independent variables and v_i are the time invariant fixed effects.

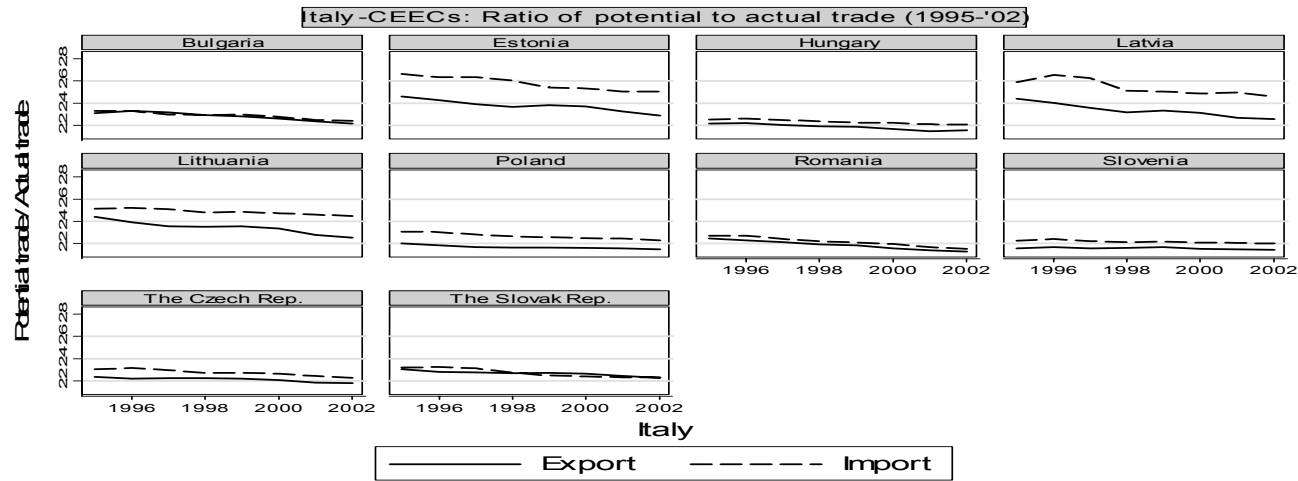
Tab. 4 - Real GDP Percentage Change (1989=100)

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001*		
													1989	2002*	
														%	
Armenia	14,2	-7,4	-11,7	-41,8	-8,8	5,4	6,9	5,9	3,3	7,3	3,3	6	74	8	
Azerbaijan	-4,4	-11,7	-0,7	-22,6	-23,1	-19,7	-11,8	1,3	5,8	10	7,4	11,1	62	8,8	
Belarus	8	-3	-1,2	-9,6	-7,6	-12,6	-10,4	2,8	11,4	8,4	3,4	5,8	91	3	
Georgia	-4,8	-12,4	-20,6	-44,8	-25,4	-11,4	2,4	10,5	10,8	2,9	3	2	37	3,5	
Kazakhstan	-0,4	-0,4	-11	-5,3	-9,3	-12,6	-8,2	0,5	1,7	-1,9	2,7	9,8	84	7,6	
Kyrgyzstan	8	3	-5	-19	-16	-20,1	-5,4	7,1	9,9	2,1	3,7	5,1	71	2	
Moldova	8,5	-2,4	-17,5	-29,1	-1,2	-31,2	-1,4	-5,9	1,6	-6,5	-3,4	2,1	37	3,5	
Russia	0	0	-5,5	-18,6	-13	-13,5	-4,1	-3,4	0,9	-4,9	5,4	8,3	64	4,1	
Tajikistan	-2,9	-1,6	-7,1	-29	-11	-18,9	-12,5	-4,4	1,7	5,3	3,7	8,3	56	7	
Turkmenistan	-6,9	2	-4,7	-5,3	-10	-17,3	-7,2	-6,7	-11,3	5	16	17,6	96	13,5	
Ukraine	4	-4	-10,6	-9,7	-14,2	-22,9	-12,2	-10	-3	-1,9	-0,2	5,9	46	4,5	
Uzbekistan	3,7	1,6	-0,5	-11,1	-2,3	-4,2	-0,9	1,6	2,5	4,4	4,1	4	105	2,5	
Estonia	8,1	-6,5	-13,6	-14,2	-8,8	-2	4,3	3,9	9,8	4,6	-0,6	7,1	90	4	
Latvia	6,8	2,9	-10,4	-34,9	-14,9	2,2	-0,9	3,7	8,4	4,8	2,8	6,8	75	4	
Lithuania	1,5	-5	-5,7	-21,3	-16,2	-9,8	3,3	4,7	7,3	5,1	-3,9	3,8	72	5,2	
Albania	9,8	-10	-28	-7,2	9,6	8,3	13,3	9,1	-7	8	7,3	7,8	116	6	
Bulgaria	0,5	-9,1	-11,7	-7,3	-1,5	1,8	2,9	-9,4	-5,6	4	2,3	5,4	80	4	
Croatia	-1,6	-7,1	-21,1	-11,7	-8	5,9	6,8	6	6,5	2,5	-0,9	2,9	85	3,5	
Czech Republic	1,4	-1,2	-11,6	-0,5	0,1	2,2	5,9	4,3	-0,8	-1	0,5	3,3	106	2,5	
Hungary	0,7	-3,5	-11,9	-3,1	-0,6	2,9	1,5	1,3	4,6	4,9	4,2	5,2	112	4	
Poland	0,2	-11,6	-7	2,6	3,8	5,2	7	6	6,8	4,8	4,1	4	129	1	
Romania	-5,8	-5,6	-12,9	-8,8	1,5	3,9	7,1	3,9	-6,1	-5,4	-3,2	1,8	84	3,5	
Slovakia	1,4	-2,5	-14,6	-6,5	-3,7	4,9	6,7	6,2	6,2	4,1	1,9	2,2	110	3,5	
Slovenia	-1,8	-4,7	-8,9	-5,5	2,8	5,3	4,1	3,5	4,6	3,8	5,2	4,6	121	2,7	
FYR Macedonia	0,9	-9,9	-7	-8	-9,1	-1,8	-1,2	1,2	1,4	3,4	4,3	4,6	77	2	

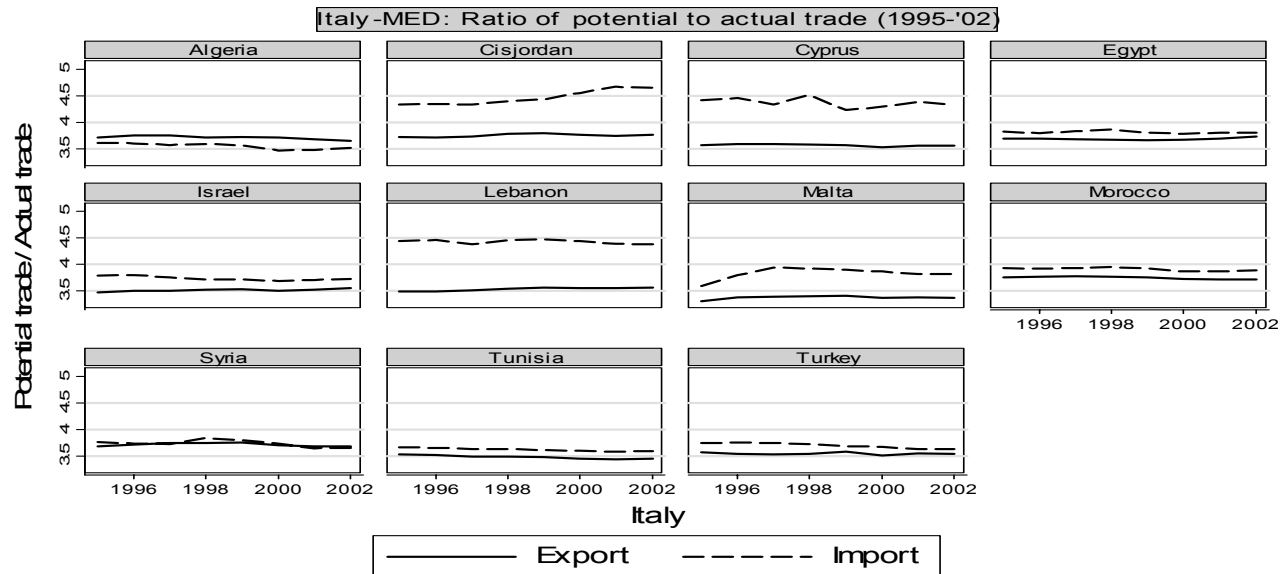
Note: Data for the year 2002 is the prognosis of the EBRD.

Source: Own elaborations on the basis of the EBRD Transition Report, 2002.

Graph 1-10

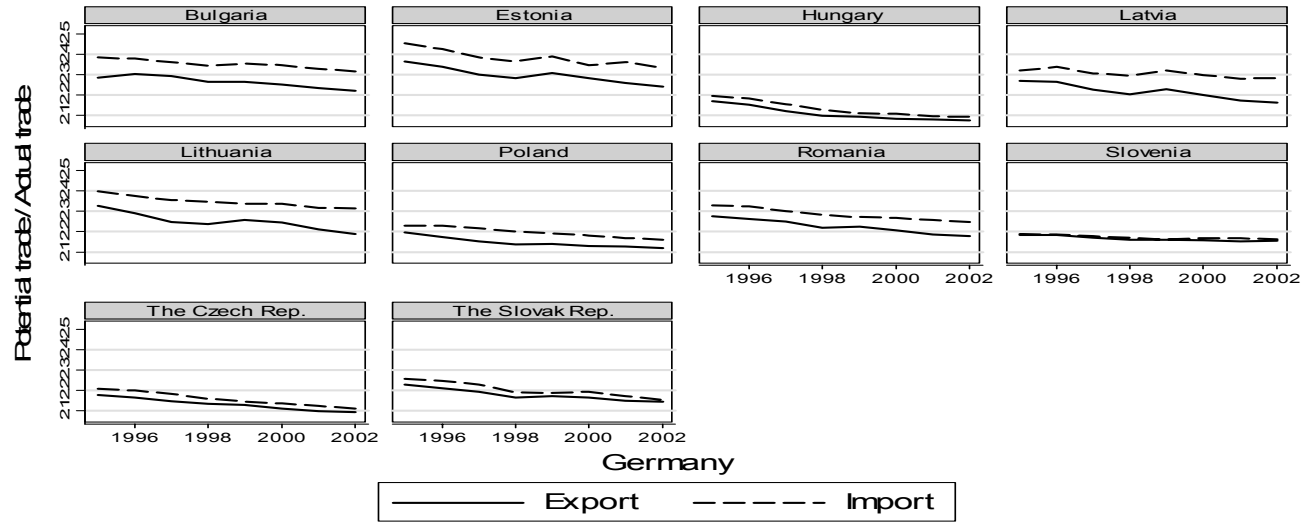


Graphs by cee1



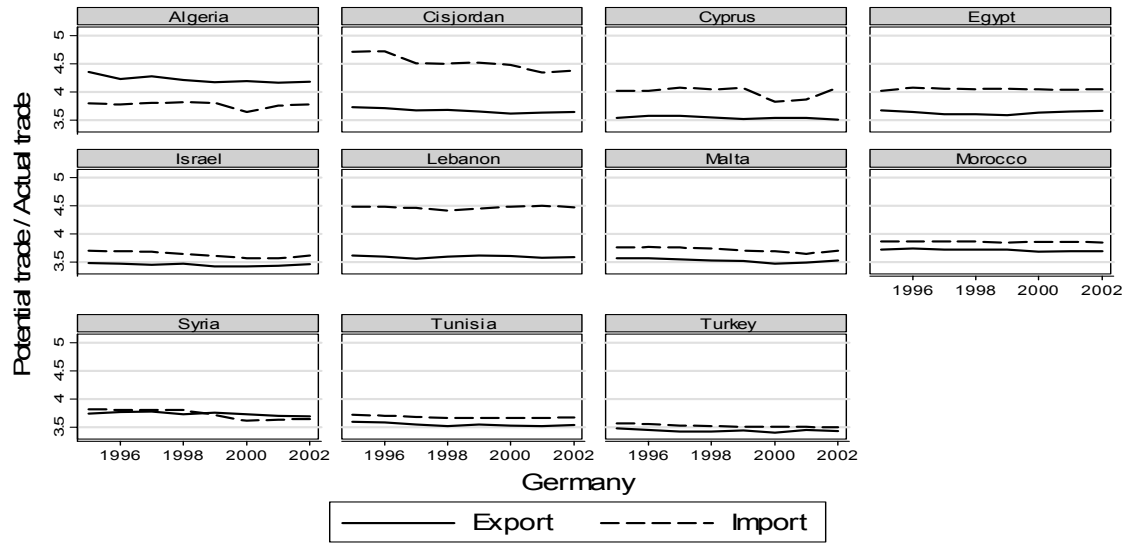
Graphs by med1

Germany-CEECs: Ratio of potential to actual trade (1995-'02)

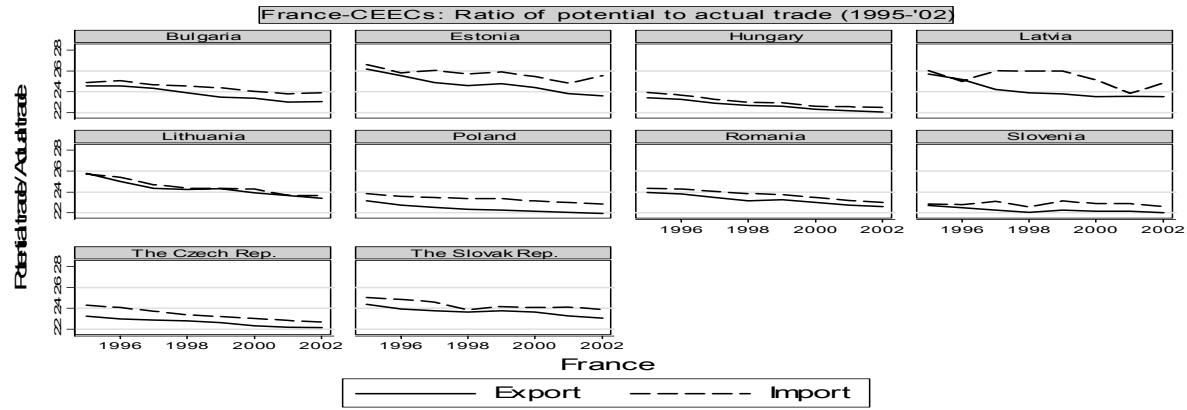


Graphs by cee1

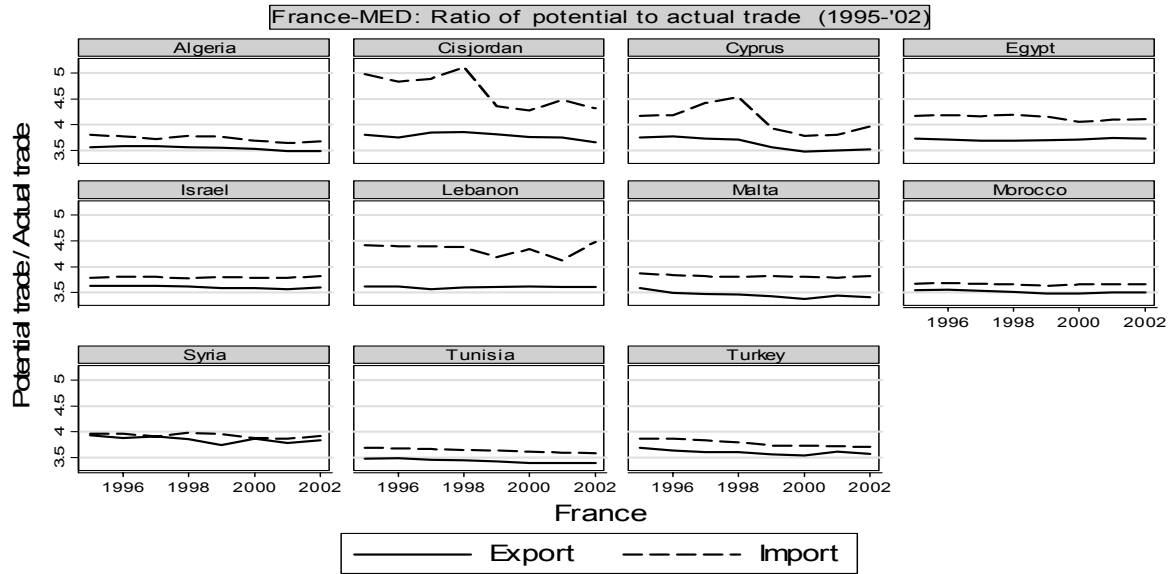
Germany-MED: Ratio of potential to actual trade (1995-'02)



Graphs by med1

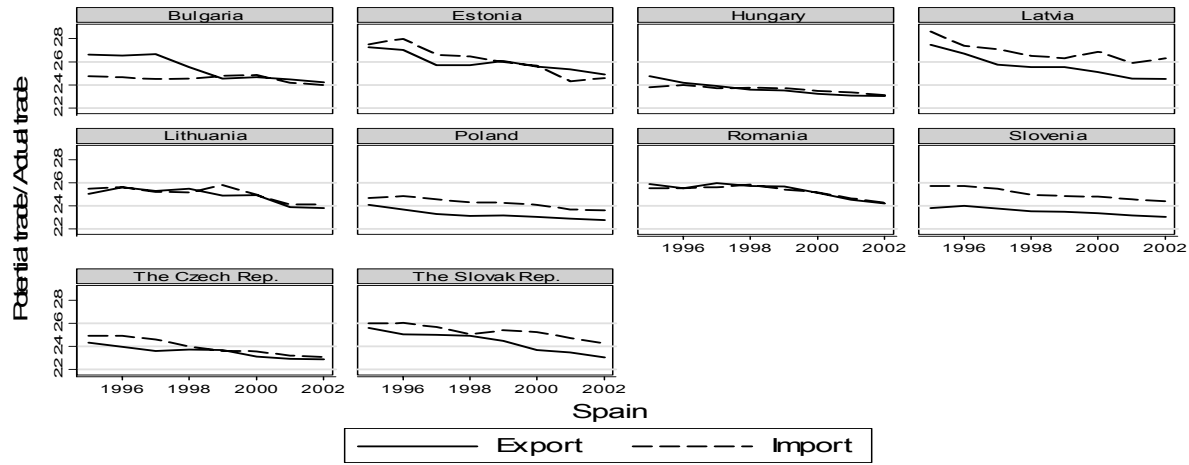


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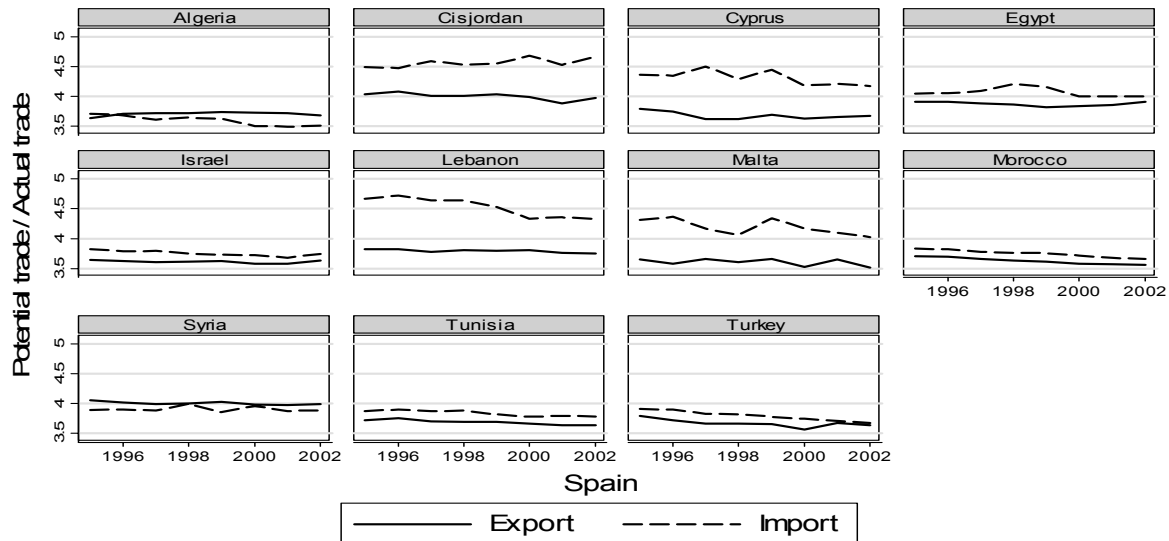
Graphs by med1

Spain-CEECs: Ratio of potential to actual trade (1995-'02)

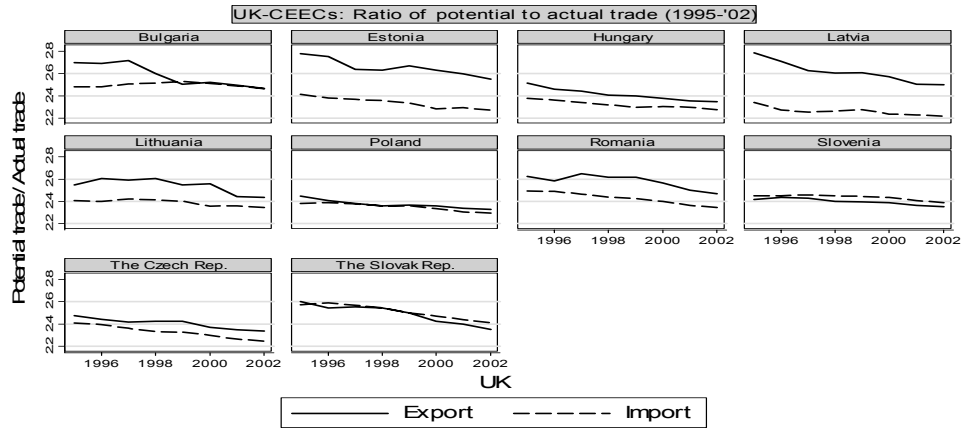


Graphs by cee1

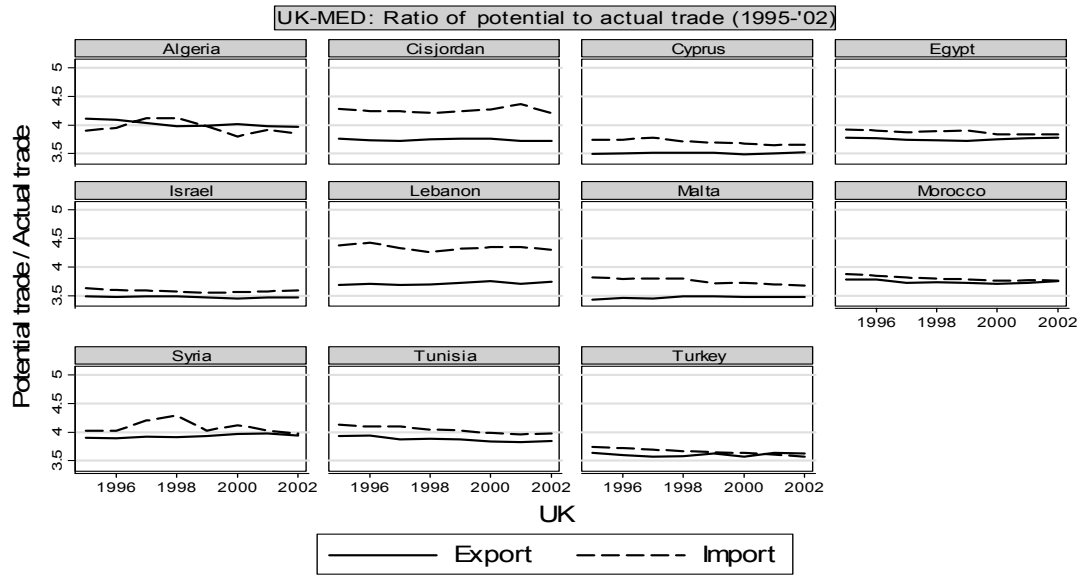
Spain-MED: Ratio of potential to actual trade (1995-'02)



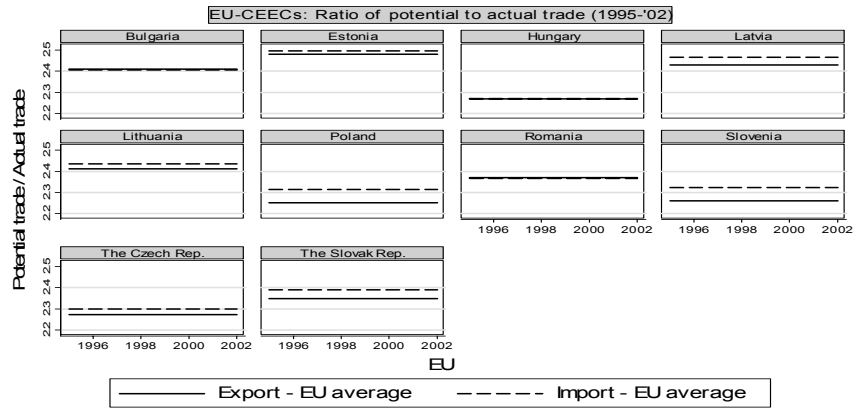
Graphs by med1



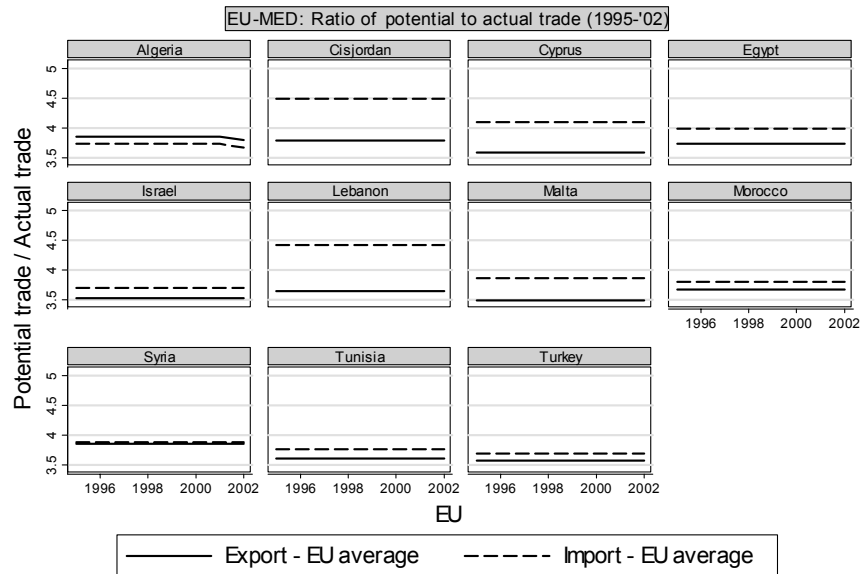
Graphs by cee1



Graphs by med1



Graphs by cee1



Graphs by med1

