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Integrating the Neighbors: A dynamic panel analysis of EU-ENP trade relations[1]

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Abstract

This paper investigates the impact of the trade relations among the EU and the European Neighborhood Policy (ENP) countries on the economic growth performance of the latter. The analysis uses panel data for 14 ENP countries over the period 2000-2011 and recently developed panel cointegration techniques to test and estimate the long-run equilibrium relationship between real GDP and trade openness indicators. The results of the analysis indicate that deeper trade integration with the advanced EU countries may have a negative impact on ENP countries GDP growth. At the same time, deeper trade integration with the middle and lower income EU member states appears to have a positive and statistically significant impact on real GDP of the ENP countries. The results also indicate that, under existing production capabilities, economic growth in ENP countries favours weaker trade integration with the advanced EU12 countries and deeper trade integration with the middle and especially the lower income EU countries. These findings have important implications for theory and policy.

KEY-WORDS: trade openness, growth performance, EU countries, ENP countries, panel cointegration, Granger causality, Panel VAR

JEL: F14, F15, F43

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1. Introduction

Expanding trade relations is one of the fundamental drivers of growth and prosperity in the classical and neoclassical setting of international economics. This near-axiomatic statement has been the foundation of modern economic thinking and the solid ground for free-trade policies and the creation of economic Unions. The universality of this theory has been recently challenged by the 'New Trade Theory' and the 'New Economic Geography' schools of thought. Trade may still be an engine for growth and prosperity and, most importantly, a guarantor of peace and security, but trade 'conditions' and 'qualifications' have been receiving increasing attention in the recent period. Questions about the allocation of the benefits (and costs) of 'strategic trade' or trade among 'unequal' or 'distant' partners are more and more often discussed in the literature, while issues related to the balance, structure and specialization receive increasing attention. The experience of the continuous rounds of EU integration, mainly through the expansion of trade relations first to the European South in the 1980s and then to the European East in the 1990s and 2000s shows a variety of performances, structures and impacts on growth and development.

Earlier studies have shown that countries in the EU South and East have been engaged in an unbalanced and asymmetric pattern of trade with the EU core countries (Petrakos and Pitelis 2001, Jackson and Petrakos 2001). At the same time, regional trade in the South among EU and non-EU countries of similar production and consumption patterns seems to operate in a complementary way, partially offsetting the adverse effects of North-South trade (Petrakos 2001, Petrakos and Christodoulakis 2001). Similar evidence comes from recent reports about the EU-ENP trade patterns, that appear to be also unbalanced and asymmetric (Petrakos et al 2013).

In a word where trade expansion is very often unbalanced, differences in development levels, technological competences, scale effects in production and market size play an important role in explaining trade patterns and the allocation of costs and benefits of greater interaction. In addition, as most gravity models would confirm, geography, in a sense of proximity and adjacency, is also an important driver of trade relations. Ceteris paribus, cross-border and regional trade is more likely to involve partners of similar levels of development and be a more balanced and symmetric type of interaction. In that perspective, it is a necessary ingredient of a trade mix that tends to be dominated by North-South and West-East relations. It has been suggested that excessive irregularity in the geographical direction of trade may have been a barrier to growth for Transition economies (Jackson and Petrakos 2001). This discussion reveals that there may be a need for a more balanced approach where trade integration among distant and unequal partners is complemented by regional trade, involving partners with similar levels of development and trade among neighbors.

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The research questions we pose in this paper are related to the openness and integration experience of the ENP countries[2], laying in the external EU periphery and targeted by the Commission's policy to become a "ring of friends" for the EU. With the exception of Israel, these countries have relatively low, by EU standards, levels of development; they are undertaking serious socioeconomic transformations and are in a process of opening their economies to the international markets. In this context, it is an interesting exercise to investigate the impact of openness to international trade and the impact of trade integration with the EU to the growth performance of these economies.

The effect of trade openness/integration on ENP economic growth is empirically assessed with the use of recently developed panel cointegration techniques, test for causality between trade and economic growth and estimating the long-run equilibrium relationship between real GDP and a set of trade indicators. The rest of the paper is structured as follows: Section 2 briefly reviews the literature. Section 3 provides the methodological strategy for addressing Granger causality with particular emphasis on contributions dealing with non-stationary and cointegrated panel dataset. Section 4 describes the data and presents the empirical results, while Section 5 concludes with some policy implications.

2. Economic integration and growth: Review of the theoretical literature

It is widely accepted that the European perspective acts as a very strong stimulus for, and facilitator of, economic, political and institutional development by providing the incentives and resources to promote economic restructuring and institutional capacity-building. It is, thus, no surprise that especially for countries that are in dire need for economic restructuring, sociopolitical transformation and development, the process of European integration, in all of its facets (i.e. economic integration, political approximation and policy harmonization), has largely gone unquestioned (Monastiriotis et al., 2010). Indeed, deeper association with the EU brings a large battery of significant political and economic benefits at the domestic national level, strengthening domestic policies and, thus, facilitating political reforms that consolidate the process of political transition, democratization and, in some cases, conflict resolution and normalization of external relations (Monastiriotis et al., 2010).

However, together with the aforementioned benefits, which are, indeed, too strong to be overlooked[3], the process of European (economic) integration[4] brings, also, effects which are of a less unequivocal character.[5]

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[2] Armenia, Azerbaijan, Belarus, Georgia, Moldova, and Ukraine in the East; Algeria, Egypt, Israel, Jordan, Lebanon, Libya, Morocco, Syria and Tunisia in the Soutn.

[3] In fact, integration is widely regarded "as one of the major drivers of increasing prosperity" (Edwards, 2007: 260).

Economic integration emaciates border obstacles for factor movements and further intensifies itself (self-sustained process) via the reduction of trade costs. Closed borders distort market size (Niebuhr and Stiller, 2002), whereas the abolition of economic barriers generates (releases) all kinds of spatial dynamics that relate to better access to foreign markets and to import competition (Brülhart et al., 2004). Therefore, even though economists accept, almost unanimously, that (the market-based process of) economic integration is a positive-sum game, an on-going debate is currently taking place concerning the distribution of the overall welfare gains (Benko and Lipietz, 1992; Guerrieri and Rossi, 2002; Petrakos et al., 2011).

Such a debate finds fertile ground since the size, the composition and the direction of trade and factor flows determine, to a large extent, the prospects and the limitations for development. To put it differently, in the (emerging) EU economic space, the space of flows (i.e. integration) affects, to a great extent, the space of places (i.e. development) (Petrakos, 2012). On the one hand, there is the view that economic integration is a long-term process that eventually leads to a reduction in inequalities through the expansion of trade relations, greater mobility of production factors and the diffusion of technology.[6] This view is based on neoclassical-type assumptions about the operation of the economy and claims that the market forces released in the process of economic integration are, overall, beneficial for the least developed economies, leading, thus, to greater cohesion. On the other hand, there is the claim that the costs and the benefits of economic integration are unlikely to be uniformly spread in space. In contrast, more advanced economies are expected to benefit more, while lagging (and, possibly, less favored) economies are more likely to benefit less, or, even, fall further behind. The resulting increase in inequalities is primarily based on internal and external economies of scale, technological progress and structural change.

In particular, proponents of the neoclassical theory argue that disparities are bound to diminish with growth, through the activation of three convergence mechanisms. The first mechanism is based on the neoclassical growth model (Solow, 1956; Swan, 1956), which assumes constant returns to scale (CRS), diminishing marginal productivity of capital, substitutability between capital and labour and exogenously determined technological progress. These assumptions indicate that, the further away an economy is from its steady-state, the faster will be the growth of income levels. In other words, economies converge towards their steady-states at a declining growth rate because the marginal productivity of capital declines. The second mechanism is the neoclassical

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[4] Integration is a very wide social, political and economic notion and a number of definitions have been proposed. Pinder (1969: 143-145), *inter alia*, describes integration "as the combination of parts into a whole". Concerning economic integration, in particular, Maksimova (1976: 33) focuses on "the process of development of deep and stable relationships of the division of labor between national economies". Holzman (1976: 59) argues that economic integration is "a situation in which the prices of all similar goods and similar factors are equalized". Pelkmans (1984: 3) considers economic integration as "the elimination of economic frontiers between two or more economies".
[5] See, for example, the cases of the new EU member-states (Daianu, 1995; Kornai, 2006; Petrakos and Kallioras, 2007; Kallioras and Petrakos, 2010), which provide a quasi-laboratory environment (or, to put it differently, natural experiment-like conditions) for the assessment of the impact of economic integration on regional inequalities.
[6] As Marshall (1890/1982: 225) indicates, "the mysteries of the trade become no mysteries; but are as it were in the air".

trade theory (Heckscher, 1919/1991; Ohlin, 1933; Samuelson, 1949), which is built on the notion of comparative advantage (see Ricardo, 1817). In this framework, economies export products that intensively utilize their abundant (and cheap) production factor and import products that require an intensive use of their scarce (and expensive) production factor. Trade integration, thus, will cause product and factor prices to converge. The third mechanism is the neoclassical factor movement model (Greenwood, 1975; Borjas, 1989; Greenwood et al., 1991), which predicts the equalization of factor prices as low-wage, less advanced economies attract capital and high-wage, more advanced economies attract labour, under the assumption of free factor movement.

Questioning the position of the neoclassical paradigm, other schools of thought tend to argue that growth is a spatially selective and cumulative process that is likely to increase inequalities, bringing earlier theories of economic space[7] back to the forefront. These approaches stress the importance of initial conditions, interactions and interdependencies for growth, arguing that divergence is the most likely spatial outcome of market dynamics if counteractive policies do not come into play. The endogenous growth theories (Romer, 1986; Lucas, 1988; Barro, 1990) indicate that investment in human resources and knowledge spill-overs may result in increasing returns to capital and divergence. The new economic geography school (Krugman, 1991; Fujita, 1993; Venables, 1996) reaches similar conclusions, assuming increasing returns to scale (IRS), monopolistic competition, labour and capital mobility, and non-zero transportation costs. Under these assumptions, economic activities tend to concentrate in specific economies, which manage to exceed a critical size threshold, driven by agglomeration economies; reduced transport costs and a “home-market” effect (see Krugman, 1980). In particular, there are two tendencies in operation.

The first one concerns a centripetal force that strengthens agglomeration of activities that belong to higher ranks in the production chain (i.e. capital-intensive and knowledge-intensive activities) in the more advanced economies, pushing the less advanced economies towards backward specializations (i.e. in labor-intensive and in resource-intensive activities). The second one concerns a centrifugal force that leads to the diffusion of production as capital moves to exploit profit opportunities (emerging for the opening-up of new markets, mainly due to the availability of relatively cheap and immobile labor force) that may exist in less advanced economies. These forces (together) may promote divergence.

Moreover, and besides the previously described debate, economic integration involves, according to the critics of the traditional trade theory, significant welfare losses for the less developed economies due to unequal exchange mechanisms. As integration improves market access and raises incomes, the patterns of consumption and production change and imports increase disproportionately to exports. This has the

[7] Such as the big-push theory (Rosenstein-Rodan, 1943), the theory of growth poles (Perroux, 1955), and the cumulative causation theory (Myrdal, 1957).

tendency to produce structural trade deficits, which threaten the stability of the local currencies and contribute to fiscal imbalances[8] (Monastiriotis et al., 2010).

Thus, there is (still) widespread (and totally justifiable) scepticism in the less-advanced and peripheral economies regarding their ability to adjust to the requirements of an integrated economic space. Imperfect competition is deemed to result in an uneven distribution of the benefits of economic integration (Lyons et al. 2001; Martin and Ottaviano, 2001; Ciccone, 2002) due to the inability of markets (and policy responses) to create conditions of optimum economic space. Such scepticism questions the neoclassical understanding for the operation of the spatial economy (Melachroinos, 2002; Petrakos, 2008). Yet, in the realm of the real world, the EU experience does not seem to (fully) support the neoclassical claim (Amin et al., 1992; Guerrieri and Rossi, 2002; Petrakos, 2008 and 2012). Core EU economies generate advantages leading to differential growth performance, through the entrenchment of internal and external economies of scale[9], and operate as hubs for economic activities associated with IRS. Conversely, peripheral EU economies, facing high(er) transaction costs, despite the on-going improvement of transportation and communication technology, host, mainly, economic activities associated with CRS.

Engaged in integration process with distant and more advanced partners, peripheral and less-advanced economies tend to develop (locked-in) an inter-industry type of trade relations (Panteladis, 2002; Kallioras and Petrakos, 2010; Petrakos et al., 2012). This type of trade relations, which imposes a specific economic structure with specialization typically in labor-intensive or resource-intensive economic activities, is the outcome of the inability of peripheral and less-advanced economies to compete (successfully) with their more advanced counterparts in the markets for capital-intensive and knowledge-intensive economic activities[10] (Brülhart and Elliott, 1998). Even though it provides an alternative (and perhaps the only feasible) route for the exploitation of the locally available skills, it is doubtful whether such a structural differentiation can produce long-term income convergence (Petrakos and Christodoulakis, 2000; Petrakos et al., 2012). Peripheral and less-advanced economies having weaker productive bases with a high share of sensitive, labor-intensive sectors and unfavorable geographic coordinates are struggling in the process of integration to effectively redeploy their resources in order to gain from the opening of markets (Camagni, 1992; Puga, 2002).

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[8] The recent experience of many peripheral EU economies (i.e. Greece, Portugal, Cyprus and Spain) confirms the truth of the aforementioned criticism (see Gligorov et al., 2012 for details). Indeed, the current turbulence and instability triggered by the public debt of the weaker EU economies has transformed a financial crisis to an economic one, affecting the productive bases and the income levels of the EU economic space in a very unequal way (Petrakos, 2012).
[9] In the nature of both Marshallian (Marshall, 1890/1982) and Jacobian (Jacobs, 1969) external economies.
[10] The question that arises here is whether research and development (R&D) investment in lagging economies is worthwhile (see Rodriguez-Pose, 2001 for a thorough survey on the issue). Besides the apparent inability of lagging economies to invest in R&D activities, since returns on investment in such activities benefit from strong cumulative effects (Dosi, 1988), knowledge derived from R&D investment is likely to spill-over from one area to neighboring areas (Jaffe, 1986).

In this papaer we will investigate the the openness and integration experience of the ENP countries[11], laying in the external EU periphery and targeted by the Commission's policy to become a "ring of friends" for the EU. With the exception of Israel, these countries have relatively low, by EU standards, levels of development; they are undertaking serious socioeconomic transformations and are in a process of opening their economies to the international markets. In this context, it is an interesting exercise to investigate the impact of openness to international trade and the impact of trade integration with the EU to the growth performance of these economies.

3. Methodology

In order to assess the effect of trade openness/integration on ENP economic growth we will employ recently developed panel cointegration techniques, and testing the causality between real GDP and a set of trade indicators. Very broadly speaking, the empirical investigation for causality between two variables in a panel context is usually conducted in three steps. First, the order of integration in the two time series variables is tested. Second, after having established the order of integration in the series, panel cointegration tests are used to examine the long-run relationships between the variables in question. If integration of order one is found, the next step is to use cointegration analysis to investigate the existence of a long-run relationship between the set of integrated variables in question. The final step is to employ dynamic panel causality tests in order to evaluate the short-run and long-run direction of causality between the variables examined.

Following the above established procedures, we examine the ENP trade growth nexus in four stages rather than three. First, we test for the order of integration in the GDP and trade openness proxies. Next, we employ panel cointegration tests to examine the long-run relationships among the variables. We then, apply dynamic panel causality tests to evaluate the short-run cointegration and the direction of causality among variables; and finally, we estimate a Panel VAR (PVAR) model for the ENP area in order to assess the qualitative and quantitative impact of trade liberalization on growth.

3.1. Panel Unit Root Tests

Conventional unit root tests for individual time series (Augmented Dickey Fuller (ADF) and Phillips and Perron tests, among others) are known to have low power against the alternative of stationarity of the series, particularly for small samples. Recent developments in the literature suggest that panel based unit root tests

[11] Armenia, Azerbaijan, Belarus, Georgia, Moldova, and Ukraine in the East; Algeria, Egypt, Israel, Jordan, Lebanon, Libya, Morocco, Syria and Tunisia in the Soutn.

have higher power than unit root tests on individual time series. Panel data provide a larger number of point data, increasing the degrees of freedom and reducing the collinearity between regressors. Hence, panel data allow for more powerful statistical tests and the test statistics asymptotically follow a normal distribution instead of non-conventional distributions. Newly developed panel unit root tests include Lenin *et al*. (2002) (herein referred to as LLC), Breitung (2000), and Im *et al*. (2003) herein referred as IPS), Maddala and Wu (1999), Choi (2001) and Hadri (2000). The basic autoregressive model can be expressed as follows:

$$y_{it} = \rho_i y_{it-1} + \delta_i X_{it} + \varepsilon_{it} \quad (1)$$

Where $i = 1,2,...,N$ represent countries observed over periods $t = 1,2,...,T$, X_{it} are exogenous variables in the model including any fixed effects or individual trend, ρ_i are the autoregressive coefficients, and ε_{it} is a stationary process. If $\rho_i < 1$, y_i is said to be weakly trend-stationary.. On the other hand, if $\rho_i = 1$, then y_i contains a unit root. LLC, BRT, and Hadri tests assume that the ε_{it} are IID ($0, \sigma_e^2$) and $\rho_i = \rho$ for all i; this implies that the coefficient of y_{it-1} is homogeneous across all cross section units of the panel and that individual processes are cross-sectionally independent. LLC and IPS seem to be most popular tests, where LLC assumes homogeneity in the dynamics of the autoregressive coefficients for all panel members, whereas IPS allows for heterogeneity in these dynamics. This is a more reasonable proposition because heterogeneity could arise from different economic conditions and levels of development in each country. IPS propose averaging the augmented Dickey Fuller (ADF), that is: $\varepsilon_{it} = \sum_{j}^{\hat{\rho}_i} \phi_{ij} \varepsilon_{it-j} + u_{it}$, allowing for different orders of serial correlation. Substituting this expression into Eq.(1), we get:

$$y_{it} = \rho_i y_{it-1} + \delta_i X_{it} + \sum_{j}^{\hat{\rho}_i} \phi_{ij} \varepsilon_{it-j} + u_{it} \quad (2)$$

where ρ_i is the number of lags in the ADF regression and the error terms u_{it} are assumed to be independently and normally distributed random variables for all i and t with zero means and finite heterogeneous variances σ_i^2. Both ρ_i and the lag order ϕ in (2) are allowed to vary among cross-sections. The null hypothesis is that each series in the panel contains a unit root ($\rho_i = 1$ for all i) whereas the alternative hypothesis is that at least one of the individual series in the panel is stationary ($\rho_i < 1$ for at least one i). The test statistic is normally distributed under the null hypothesis and the critical values for given values of N and T are provided in Im *et al*. (2003). In our study, we have considered several alternative unit root tests such as LLC, IPS and Breitung.

3.2. Panel Cointegration

If two series are both integrated of order one, then the next step in our analysis is to test for cointegration. The extensive interest in and the availability of panel data has led to an emphasis on extending various statistical tests to panel data. Recent literature has focused on tests of cointegration in a panel setting. The most popular panel cointegration tests are: Pedroni (1999), Pedroni (2004), Kao (1999) and a Fisher-type test using an underlying Johansen methodology (Maddala and Wu 1999). The Pedroni and Kao Tests are based on Engle-Granger (1987) two-step (residual-based) cointegration tests. The Fisher test is a combined Johansen test. In our analysis, we employ three kinds of panel Cointegration tests: Pedroni's (2004), Kao's (1999), and Johansen's (1988) Fisher panel Cointegration tests. The tests are implemented on the residuals obtained from the following regression:

$$lrgdp_{it} = \alpha_i + \delta_t + \beta_{1i} lrtrade_{it} + \varepsilon_{it}; \qquad i = 1,\ldots,N \text{ and } t = 1,\ldots,T \qquad (3)$$

ε_{it} is the estimated residuals indicating deviations from the long-run relationship. With the null hypothesis of no cointegration, the panel cointegration test is essential a test of unit roots in the estimated residuals of the panel: in the presence of a cointegrating relation; the residuals are expected to be stationary. Pedroni (1999) refers to seven different statistics for this test. They are Panel v-Statistic, Panel rho-Statistic, Panel PP-Statistic, Panel ADF-Statistic, Group rho-Statistic, Group PP-Statistic, and Group ADF-Statistic. The first four statistics are known as panel cointegration statistics and are based on the within approach; the last three statistics are group panel cointegration statistics and are based on the between approach. In the presence of a cointegrating relationship, the residuals are expected to be stationary. The panel v-Statistic is a one sided test where large positive values reject the null of no cointegration. For the remaining statistics, large negative values reject the null hypothesis of no cointegration. Furthermore, in our empirical analysis we use to additional cointegration tests. The first is the Kao (1999) test, which is based on the Engle-Granger two-step procedure, and imposes homogeneity on the members in the panel. The null hypothesis of no cointegration is tested using an ADF-type test. The second is the Fisher's test, which aggregates the p-values of the individual Johansen maximum likelihood cointegration test statistics (see Maddala and Kim, 1998; Maddala and Wu, 1999). The Fisher test is a non-parametric test that does not assume homogeneity in the coefficients. A detailed presentation of the three tests is provided in the Appendix I.

3.3. Dynamic Panel Causality and Long-Term Relationships

Pedroni's heterogeneous panel cointegration tests and the above mentioned cointegration tests are only able to indicate whether or not the variables are cointegrated and if a long-run relationship exists between them. Since they do not indicate the direction of causality, we estimate the two-step panel-based Vector Error Correction Model (VECM) proposed by Engle and Granger (1987) and use it to conduct granger causality tests on the GDP-EU TRADE Openness relationship. We estimate the long-run equilibrium relationship given by the Error Correction Term (ECT henceforth), which is a measure of the extent by which the observed values in time $t-1$ deviate from the long-run equilibrium relationship. Since the variables are cointegrated, any such deviation at time $t-1$ should induce changes in the values of the variables in the next time point, in an attempt to force the variables back to the long-run equilibrium relationship.

The long-run equilibrium coefficients can be estimated by using single equation estimators such as the fully modified OLS procedures (FMOLS) developed by Pedroni (2000), the dynamic OLS (DOLS) estimator from Mark and Sul (2003), the pooled mean group estimator (PMG) proposed in Pesaran et al. (1999) or by using system estimators as panel VARs estimated with Generalized Method of Moments (GMM) or Quasi Maximum Likelihood (QML). Single equation approaches assume there is homogeneity between cross section units for the long-run relationship whereas short-run dynamics are allowed to be cross section specific. While this restriction may seem too severe for some variables, on the other hand, allowing all parameters to be panel-specific would considerably reduce the appeal of a panel data approach (Breitung and Pesaran, 2005). In our study, in order to obtain the residuals which will be included in the panel VECM as the error correction terms (ECTs), we use the dynamic ordinary least squares (DOLS) estimator proposed by Mark and Sul (2003). The DOLS estimator corrects standard OLS for bias induced by endogeneity and serial correlation on the leads and lags of the first-differenced regressors from all equations to control for potential endogeneities. Then the OLS method is applied using the residuals from the first step regression. Wagner and Hlouskova (2010) verify that the DOLS estimator outperforms all other studied estimators, both single equation estimators and system estimators, even for large samples. According to Harris and Sollis (2003) non-parametric approaches such as FMOLS are less robust if the data have significant outliers and also have problems in cases where the residuals have large negative moving average components, which is a fairly common occurrence in macro time series data. The DOLS has been applied to the following two equations:

$$lrgdp_{it} = \alpha_{1i} + \delta_{1i}t + \beta_{1i} lrtrade_{it} + \eta_{it} \quad (4)$$

$$lrtrade_{it} = \alpha_{2i} + \delta_{2i}t + \beta_{2i} lrgdp_{it} + \varphi_{it} \quad (5)$$

where $i = 1,...,N$ refers to each country in the panel and $t = 1,...,T$ denotes the time period, $lrgdp$, and $lrtrade$ are the natural logarithms of real GDP, and real trade openness proxy respectively; since, all variables are in natural logarithms, the estimated long-run coefficients can be interpreted as elasticities. α_i and δ_i are country specific and time specific fixed effects, respectively.

After the estimated residuals- ECTs (η_{it}, φ_{it}) are obtained, we proceed in estimating a panel-based Vector Error Correction Model (VECM) proposed with the one-period lagged residuals proposed by Holtz-Eakin *et al.* (1988). The empirical model is presented by the following two-equation VECM:

$$\Delta lrgdp_{i,t} = \alpha_{1,i} + \sum_{k=1}^{h} \theta_{1,1,i,k} \Delta lrgdp_{i,t-k} + \sum_{k=1}^{h} \theta_{1,2,i,k} \Delta lrtrade_{i,t-k} + \lambda_{1,i}\eta_{i,t} + u_{1,i,t} \quad (6)$$

$$\Delta lrtrade_{i,t} = \alpha_{2,i} + \sum_{k=1}^{h} \theta_{2,1,i,k} \Delta lrtrade_{i,t-k} + \sum_{k=1}^{h} \theta_{2,2,i,k} \Delta lrgdp_{i,t-k} + \lambda_{2,i}\phi_{i,t} + u_{2,i,t} \quad (7)$$

Where the variables are as previously defined; Δ is the difference operator; η_{it}, φ_{it} s are the lagged residuals derived from the long-run cointegrating relationship; $\theta_{i,i,i,k}$'s are the short-run adjustment coefficients; $\lambda_{i,i}$ measures how fast the values of the variables of the system come back to the long-run equilibrium levels when they deviate from it. $u_{1,i,t}$ and $u_{2,i,t}$ are disturbance terms assumed to be uncorrelated with mean zero.

By using the variables in their differenced form, we take care of the OLS estimation problem, which is due to correlation between country-specific effects and explanatory variables. Nevertheless, differencing introduces the problem of simultaneity because the lagged dependent variables are correlated with the differenced error term. Furthermore, heteroscedasticity in the errors across the cross-section members is expected to occur, hence, we have to apply an instrumental variable estimator to cope with these problems. A widely used estimator for the system in Eqs. (6)–(7) is the panel generalised method of moments (GMM) estimator proposed by Arellano and Bond (1991). Predetermined lags of the system variables are used as instruments to obtain consistent results. Following, Engle and Yoo (1987), we use the Akaike (1974) information criterion, to determine the optimal specifications of equations (4) and (5). Estimating equations (4) and (5) for several values of k, we find the appropriate model by minimising AIC. A lag length of k=2 proves to be necessary to remove serial correlation in the error term. Hence, we employ variables lagged three and four periods as instruments for the lagged dependent variables.

The source of causation can be identified by testing the significance of the coefficients of the independent variables, $\Delta lrgdp_{i,t-k}$ and $\Delta lrtrade_{i,t-k}$ in Eq. (6)-(7). For instance, to check for short-run causality, we test $H_0 : \theta_{1,2ik} = 0, \ \forall \ ik$, i.e. to detect whether causality runs from real trade to real GDP in Eq. (6). The underlying null hypotheses for testing whether short-run causality runs from real GDP to real trade in Eq. (7) are $H_0 : \theta_{2,2ik} = 0, \ \forall \ ik$. Second, we check for long-run causality by testing the significance of the speed of adjustment, i.e. we test whether the coefficient of the respective error-correction term represented by $\lambda_{i,t}$ is equal to zero. Finally, we test for strong causality by applying joint tests including the coefficients of the respective explanatory variables and the respective error-correction term of each equation ($lrtrade$ with η; $lrgdp$ with φ). This specific notion of causality denotes which variables bear the burden of a short-run adjustment to re-establish a long-run equilibrium, following a shock to the system. In the case of no causality in either direction the neutrality hypothesis holds.

3.4. Panel VAR Methodology

Panel VAR models have become increasingly popular in studying the transmission of shocks across countries (Ballabriga et al., 1998). At the same time, developments in computer technology have permitted the estimation multicountry VAR models in reasonable time, making them potentially usable for a variety of forecasting and policy purposes. Nevertheless, the theory for panel VAR is somewhat underdeveloped. The pioneered works of Chamberlain (1982, 1984), Holtz-Eakin et al. (1988) and Binder et al. (2000), who specify panel VAR models for micro-data, have been criticized by Pesaran and Smith (1996), Canova and Marcet (1997) and Hsiao et al. (1999) for their specification and the estimation of (univariate) dynamic macro-panels. Garcia Ferrer et al. (1987), Zellner and Hong (1989), Zellner et al. (1991), on the other hand, have provided Bayesian shrinkage estimators and predictors for similar models. In general the model specification in the above studies is as follows:

$$y_{it} = A(L) y_{it-1} + \varepsilon_{it} \qquad (8)$$

Where y_{it} is $Gx1$ vector, $i = 1, \dots, N$; $A(L)$ is a matrix in the lag operator; $\varepsilon_{it} = \alpha_i + \delta_i + u_{it}$, where δ_i is a time effect; α_i is a unit specific effect; u_{it} a disturbance term. According to Canova and Ciccarelli (2004), two main restrictions characterize this specification. First, it assumes common slope coefficients. Second, it does not allow for interdependencies across units. With these restrictions, the interest is typically in estimating the average dynamics in response to shocks (the matrix $A(L)$). Canova and Marcet, Pesaran and Smith and others, instead, use a univariate dynamic model of the form:

$$y_{it} = \alpha_i + \rho_i y_{it-1} + x'_{it}\beta_i + v'_{it}\delta_i + \varepsilon_{it} \quad (9)$$

Where y_{it} is a scalar, x_{it} is a set of k is exogenous unit specific repressors, v_{it} is a set of h is exogenous repressors common to all units, while, ρ_i, β_i, and δ_i are unit specific vectors of coefficients. Two restrictions are implicit also in this specification as pointed out by Canova and Ciccarelli (2004). First, no time variation is allowed in the parameters. Second, there are no interdependencies either among different variables within units or among the same variable across units. Canova and Ciccarelli (2004) relax these restrictions and study the issues of specification, estimation and forecasting in a macro-panel VAR model, taking into consideration the Bayesian view of VAR analysis. Such an approach has been widely used in the VAR literature since the works of Doan et al. (1984), Litterman (1986), and Sims and Zha (1998) and provides a convenient framework where one can allow for both interdependencies and meaningful time variations in the coefficients. The model is specified as follow:

$$y_{it} = A_{it}(L) y_{it-1} + \varepsilon_{it} \quad (10)$$

In their approach, Canova and Ciccarelli (2004) instead of constraining the coefficients to be the same across units, they assume that they are random and they introduce a prior distribution on $A_{it}(L)$. Further, they decompose the parameter vector into two components, one which is unit specific and one which is time specific, and they specify a flexible prior on the two components which parsimoniously accounts for interdependencies in the cross section and for time variations in the evolution of the parameters. The prior shares features with those of Lindley and Smith (1972), Doan et al. (1984) and Hsiao et al. (1999) and has a hierarchical structure, which allows for various degrees of ignorance in the researcher's information about the parameters. Bayesian VARs are known to produce better forecasts than unrestricted VAR and, in many situations, ARIMA or structural models (Canova, 1995 for references). By allowing interdependencies and some degree of information pooling across units, we introduce an additional level of flexibility which may improve the forecasting ability of these models. One commonly used prior is the Minnesota-type prior. (A detailed account on different type of priors, see Canova (1995)).
Hence, the general specification (reduce form) model is specified as follows:

$$y_{it} = \sum_{j=1}^{N} \sum_{t=1}^{p} b^{j}_{it,1} y_{jt-1} + d_{it} v_t + u_{it} \quad (11)$$

where $i = 1, \dots, N$; $t = 1, \dots, T$; y_{it} is $Gx1$ vector for each i , $b^{j}_{it,1}$ are GxG matrices, d_{it} is Gxq; v_t is a $qx1$ vector of exogenous variables, common to all units, and u_{it} is a $Gx1$ vector of random disturbances. Here p is the number of lags, G the number of endogenous variables and q the number of exogenous variables (including a constant). The above specification has two features. First, the coefficients are allowed to vary both across units and across time. Second, there are interdependencies among units whenever $b^j_{it,1} \neq 0$ for $j \neq i$ and for any l. Rewriting (4) in a stacked regression manner:

$$Y_t = W_t \gamma_t + U_t \tag{12}$$

where $W_t = I_{NG} \otimes X_t'$; $X_t = (Y'_{t-1}, Y'_{t-2}, \dots, Y'_{t-p}, v'_t)$; $\gamma_t = (\gamma'_{1t}, \dots, \gamma'_{Nt})$ and $\gamma_{it} = (\beta^1_{1t}, \dots, \beta^G_{Nt})$. Here, $y_s(s < t)$ is an $NGx1$ vector, β^G_{Nt} are $kx1$ vectors. $k = NGp + q$ containing, stacked, the g rows of the coefficients matrices b_{it} and d_{it}, while Y_t and U_t are $NGx1$ vectors containing the endogenous variables and the random disturbances of the model. Canova and Ciccarelli (2004) points out that if γ_{it} are different for each cross-sectional unit in different time periods, there is no way to obtain meaningful estimates of them using classical methods, therefore, one possibility is to view each coefficient vector as random with a given probability distribution. The following assumptions are made:

1. For each i, the $Gkx1$ vector has a time invariant and a time varying component:

$$\gamma_{it} = \alpha_i + \lambda_{it} \tag{13}$$

2. For each i, the $Gkx1$ vector α_i is normally distributed

$$\alpha_i \sim N(R_i, \bar{\alpha}, \Delta_i) \tag{14}$$

   Where$R_i = I_G \otimes E_i$; $\Delta_i = V \otimes E_i \Omega_1 E_i$, the GxG matrix V and the kxk matrix Ω_1 are symmetric and positive semidefinite E_i is kxk matrix that commutes the k coefficients of unit i for each of the each G equations with those of unit one, assuming that each $cov(\alpha_i, \alpha_j) = 0 \ \forall i \neq j$.

3. The mean vector $\bar{\alpha}$ is assumed to have a normal distribution

$$\bar{\alpha} \sim N(\mu, \Psi) \tag{15}$$

4. For each i, $\lambda_{it} = R_i \lambda_t$, with λ_t independent of α_t. The $Gkx1$ vector λ_t evolves according to:

$$\lambda_t = B\lambda_{t-1} + (I - B)\lambda_0 + e_t, \tag{16}$$

5. Where $B = \rho * I_{GK}$ and, conditional on U_t and W_t, $e_t \sim N(0, V \otimes \Omega_{2t})$, $\Omega_{2t} = v_1 \Omega_{2t-1} + v_{12} \Omega_{20}$ and Ω_{20} is a positive semidefinite, symmetric matrix. The initial conditions are such that $\lambda_0 \sim N(\bar{\lambda}_0 V \otimes \Omega_{20}$.

6. Conditional on W_t, the vector of random disturbances U_t has a normal distribution:

$$U_t \sim N(0, \Sigma_u) \tag{17}$$

where $\Sigma_u = \Sigma \otimes H$, Σ is NxN and H is GxG, both positive definite and symmetric matrices.

Assumptions 1–4 decompose the parameters vector for each i in 2 components: one is unit specific and constant over time; the other is common across units but varies with time. The prior possibility for time-variation increases the flexibility of the specification and provides a general mechanism to account for structural shifts without explicitly modeling the source of the shift. The fact that the time-varying parameter vector is common across units does not prevent unit-specific structural shifts, since γ_{it} can be re-written as:

$$\gamma_{it} = (1 - B)(\alpha_i + \lambda_{i0}) + (I - B)\gamma_{it-1} + e_{it} \tag{18}$$

where unit specific variations of time occur through the common coefficient vector B.

Assumptions 2 and 3 can be used to recover the vector α or the mean coefficient vector $\bar{\alpha}$. In this sense, "fixed" and "random" effects can be distinguished as Lindley and Smith (1972). Assumption 2 allows for some degree of a priori pooling of cross-sectional information via an exchangeable prior on α_i. This may be useful in a panel when there are similarities in the characteristics of the vector of variables across units. In this case coefficients of other units may contain useful information for estimating the coefficients of unit i.

Following Canova and Ciccarelli (2004), we adapt the so-called Minnesota prior to a panel VAR framework. The Minnesota prior, described in Litterman (1986), Doan et al. (1984), Ingram and Whiteman (1994), Ballabriga et al. (1998) among others, is a way to account for the near nonstationarity of many macroeconomic time series and, at the same time, to weakly reduce the dimensionality of a VAR model. Given that the intertemporal dependence of the variables is believed to be strong, the prior mean of the VAR coefficients on the first own lag is set equal to one and the mean of remaining coefficients is equal to zero. The covariance matrix of the coefficients is diagonal (so we have prior and posterior independence between equations) and the elements are specified in a way that coefficients of higher order lags are likely to be close to zero (the prior variance decreases when the lag length increases). Moreover, since most of the variations in the VAR variables are accounted for by own lags, coefficients of variables other than the dependent one are assigned a smaller relative variance. The prior on the constant term, other deterministic and exogenous variables, is diffuse. Finally, the variance–covariance matrix of the error term is assumed to be fixed and known.

For the Panel VAR setup the following modification is introduced: The covariance-matrices Ω_{20}, Ψ, Δ, are assumed to have the same structure, i.e. $\Delta = diag(\Delta_1, \dots, \Delta_n)$, where $\Delta_i = V \otimes E_i \Omega_1 E_i$. It is assumed that $V = H$ and that Ω_1 is diagonal with elements:

$$\sigma^2_{g_i j_s} = \left(\frac{\theta_{1\alpha} \theta_3^{\delta(g_i j_s)}}{l^{\theta_2}} \frac{1}{\sigma_{js}} \right)^2 g,\ j = 1, \dots, G, i, s = 1, \dots, N, l = 1, \dots, \rho, \qquad (19)$$

Where $\delta(g_i j_s) = 0$ if $i = s$ and 1, otherwise $\sigma^2_{gm} = (\theta_{1\alpha}\theta_4)^2$, $m = 1, \dots, q$. Here, g_i represents equation g of unit i, j_s the endogenous variable j of unit s, l the lag, m exogenous or deterministic variables. The hyperparameter $\theta_{1\alpha}$ controls the tightness of beliefs for the vector α; θ_2 the rate at which the prior variance decays with the lag; θ_3 the degree of uncertainty for the coefficients of the variables of unit s in the equations of unit i; θ_4 the degree of uncertainty of the coefficients of the exogenous variables and σ_{js} are the diagonal elements of the matrix Σ_u used as scale factors to account for differences in units of measurement. Finally, there is no distinction between own versus other countries variables (see Sims and Zha, 1998). The structures for Ψ and Ω_0 are identical with θ_1 being replaced by $\theta_{1\pi}$ and $\theta_{1\lambda}$, respectively. To complete the specification, the elements of the matrix H and the σ ' s are estimated from the data to tune up the prior to the application. Summing up, our prior information can be represented with a nine-dimensional vector of hyperparameters $\Theta = (\theta_{1\alpha}, \theta_{1\lambda}, \theta_{1\overline{\alpha}}, \theta_1, \theta_2, \theta_3, \theta_4, \theta_5, \theta_6, \theta_7)$. Estimates of Θ can be obtained by maximizing the predictive density of the model as in Doan et al. (1984).

4. Data and Empirical Results

Our dataset comprises annual measures for 14 ENP countries: Algeria, Armenia, Azerbaijan, Belarus, Egypt, Georgia, Israel, Jordan, Lebanon, Moldova, Morocco, Occupied Palestinian Territory (hereinafter: Palestine), Syria, Tunisia and Ukraine. Annual data for GDP were obtained from the World Bank Development Indicators online database and bilateral trade data for each ENP country with each of the EU 27 countries were obtained from the UN COMTRADE online database. The data are employed in constant US Dollars (year 2000) and constant exchange rates. All variables are used in natural logarithms to achieve stationarity in variance. The choice of the starting period was constrained by the availability of data on bilateral trade.

For the purpose of our study and in order to investigate how trade relations with the EU27 have affected economic growth of the ENP countries, we employ real Gross Domestic Product and six different trade indicators. Our trade indicators are divided into to two categories: the first category measures trade openness (i.e. bilateral trade data normalized by GDP) and the second one measures trade integration (i.e. the share of intraregional trade in total trade). Henceforward, our trade variables are defined as follows: The first indicator is calculated by the total real exports from the ENP countries to the EU 27 countries; the second one by the total imports from the EU27 to the ENP countries; the third one which is a measure of trade openness is the ratio of real exports plus real imports divided by real GDP; the fourth indicator is the share of total real exports to EU27 in total exports; the fifth is the share of total real imports from EU27 to total imports of the ENP countries; and the last one is the trade intensity of trade with EU 27 and is calculated as the share of real exports plus imports with the EU 27 to total exports and imports of the ENP countries. The last three indicators are measures of trade integration.

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Table 1. Definition of Variables and acronyms

Economic Activity Variables (World Bank development Indicators (WBDI) online database)	
$rgdp_{it}$	GDP (constant at 2000 US$)
National Trade Openness Indicators (UNCTAD online database)	
$rexp_{it}$	Total Real Exports (constant 2000 US$)
$rimp_{it}$	Total Real Imports (constant 2000 US$)
EU Trade Openess/ Integration Indicators (UN COMTRADE online database)	
Trade with the EU27	
$reu27exp_{it}$	Real Exports to EU 27 countries (constant 2000 US$)
$reu27imp_{it}$	Real Imports to EU 27 countries (constant 2000 US$)
$reu27xmg_{it}$	Real exports to EU 27 plus real imports to EU 27 countries over real GDP of the ENP countries $((reu27exp_{it} + reu27imp_{it})/ rgdp_{it}))$
$reu27xtx_{it}$	Real Exports to EU 27 over total real exports of the ENP countries $(reu27exp_{it}/rexp_{it})$
$reu27mtm_{it}$	Real imports from EU 27 over total real imports of the ENP countries $(reu27imp_{it}/rimp_{it})$
$reu27trade_{it}$	Real exports to EU 27 plus real imports to EU 27 countries over Real total exports and real total imports $((reu27exp_{it} + reu27imp_{it})/(rexp_{it} + rimp_{it}))$
Trade with the Upper Income EU countries – Panel 1 consisting of 12 countries: Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, Luxemburg, Netherlands, Sweden, and UK	
$reu12exp_{it}$	Real Exports to EU 12 countries (constant 2000 US$)
$reu12imp_{it}$	Real Imports to EU 12 countries (constant 2000 US$)
$reu12xmg_{it}$	Real exports to EU 12 plus real imports to EU 12 countries over real GDP of the ENP countries $((reu12exp_{it} + reu12imp_{it})/GDP_{it}))$
$reu12xtx_{it}$	Real Exports to EU 12 over total real exports of the ENP countries $(reu12exp_{it}/rexp_{it})$
$reu12mtm_{it}$	Real imports from EU 12 over total real imports of the ENP countries $(reu12imp_{it}/rimp_{it})$
$reu12trade_{it}$	Real exports to EU 12 plus real imports to EU 12 countries over Real total exports and real total imports $((reu12exp_{it} + reu12imp_{it})/(rexp_{it} + rimp_{it}))$
Trade with the Middle Income EU countries – Panel 2 consisting of 7 countries: Cyprus, Greece, Malta, Portugal, Czech Republic, Slovenia and Spain	
$reu7exp_{it}$	Real Exports to EU 7 countries (constant 2000 US$)
$reu7imp_{it}$	Real Imports to EU 7 countries (constant 2000 US$)
$Reu7xmg_{it}$	Real exports to EU 7 plus real imports to EU 7 countries over real GDP of the ENP countries $((reu7exp_{it} + reu7imp_{it})/GDP_{it}))$
$Reu7xtx_{it}$	Real Exports to EU 7 over total real exports of the ENP countries $(reu7exp_{it}/rexp_{it})$
$Reu7mtm_{it}$	Real imports from EU 7 over total real imports of the ENP countries $(reu7imp_{it}/rimp_{it})$
$reu7trade_{it}$	Real exports to EU 7 plus real imports to EU 7 countries over Real total exports and real total imports $((reu7exp_{it} + reu7imp_{it})/(rexp_{it} + rimp_{it}))$
Trade with the Low Income EU countries – Panel 3 consisting of 8 countries: Romania, Slovakia, Poland, Lithuania, Latvia, Hungary, Estonia, Bulgaria	
$reu8exp_{it}$	Real Exports to EU 8 countries (constant 2000 US$)
$reu8imp_{it}$	Real Imports to EU 8 countries (constant 2000 US$)
$reu8xmg_{it}$	Real exports to EU 8 plus real imports to EU 8 countries over real GDP of the ENP countries $((reu8exp_{it} + reu8imp_{it})/GDP_{it}))$
$Reu8xtx_{it}$	Real Exports to EU 8 over total real exports of the ENP countries $(reu8exp_{it}/rexp_{it})$
$Reu8mtm_{it}$	Real imports from EU 8 over total real imports of the ENP countries $(reu8imp_{it}/rimp_{it})$
$reu8trade_{it}$	Real exports to EU 8 plus real imports to EU 8 countries over Real total exports and real total imports $((reu8exp_{it} + reu8imp_{it})/(rexp_{it} + rimp_{it}))$

The variables' notations and definitions are provided in Table 1. In addition to the entire panel, we segment the data set into three subpanels according to per capita income of the EU27 trade partners. Panel 1 includes 12 EU countries having relatively high GDP per capita (above the EU average): Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, Luxemburg, Netherlands, Sweden, and UK; Panel 2 includes 7 EU countries having medium (above 75% of the EU average) GDP per capita level: Cyprus, Czech Republic Greece, Malta, Portugal, Slovenia and Spain; and Panel 3 includes 8 EU countries having low (below 75% of the EU average) GDP per capita: Romania, Slovakia, Poland, Lithuania, Latvia, Hungary, Estonia, Bulgaria. The main aim for doing so is to investigate the causal dynamics of the trade relations of the ENP countries with the upper, middle and the low income EU 27 trade partners, and assess whether growth effects of trade openness/integration are different with the EU trade partners of different level of development.

To test the nature of association between the two variables while avoiding any spurious correlation, the empirical investigation, in this paper we follow the following four steps: We begin by testing all of our variables for non-stationarity for the four different panels of countries. Prompted by the existence of unit roots in the time series, at the second stage of our empirical investigation and using the panel cointegration technique developed by Pedroni (1995, 1999), we test for long-run cointegrating relation between different pairs of variables (i.e. real GDP with each of the trade indicators for each panel of countries). Granted the long-run relationship, at the third stage we explore the causal link between the different pairs of variables by testing for Granger causality; while at the final stage, we estimate a Panel VAR for the ENP in order to assess the qualitative and quantitative impact of trade openness/integration on growth of the ENP countries.

4.1. Panel Unit root tests

We begin our analysis by conducting several panel unit root and stationarity tests, since, determining the time-series properties of the variables is an important step given that the presence of non-stationary regressors invalidates many standard hypotheses tests (Granger and Newbold, 1974). We have computed two sets of tests making the following specifications: a) assuming a common unit root process across countries (Levin, Lin, and Chu (LLC 2002)'s test; Breitung (2000)'s test); and b) positing individual unit root processes (Im, Pesaran, and Shin (IPS 2003)'s test; Maddala and Wu (1999)'s ADF-Fisher test). All the four panel unit root tests have the null hypothesis of unit roots. Sets of these four statistics for each of the variables examined have been reported in Annex II. Tables II.1.(a). and II.1.(b). The first four columns report the panel unit-root statistics for the variables at the levels. As it can be inferred from this table, we cannot reject the unit-root hypothesis when the variables are taken in levels and thus any causal inferences from the series in levels are invalid. Three out of four tests report evidence of unit roots in most cases. The last four columns report the panel unit-root statistics for the first differences of each variable. The majority of the test statistics indicate rejection of the null of non-stationarity at 5% level for all variables. It may therefore, be concluded that the variables under study are unit-root variables of order one, or they are integrated of order one, I(1).

4.3. Panel Cointegration Analysis

Having found that all variables in question are integrated of order one (I(1)), we then proceed to test whether a long-run relationship exists between them. Pedroni's within and between dimension results of the panel cointegration tests together with Kao's panel Cointegration test results on different sets of variables are presented in the Annex III Table III.2.(a). and Table III.2.(b). Three of the four panel test statistics and two of the three group test statistics suggest that there is a panel cointegration among the different sets of variables for the four panels of countries. For all sets of variables, the group Phillips and Perron (1988) type rho-statistic and the group Dickey and Fuller (1979) ADF type t-statistic are statistically at the 5% level or better. According to Pedroni (2004), the Phillips and Perron (1988) type rho and t-statistics tend to under reject the null in the case of small samples. Thus, given that two of the three tests suggest panel cointegration in most cases, it is reasonable to conclude that all variable sets are cointegrated. In sum, overall, there is strong statistical evidence in favor of panel cointegration; hence, there may be a long-run relationship between real GDP and each of the six trade indicators for our four panels of data variable.

In contrary, Kao's (1999) residual panel cointegration tests accept the null of no cointegration in all cases of different sets of variables at 5% significance level. Given that there are contradictions of the test results of the previous two tests, we then use the Johansen approach to confirm (or infirm) these results. The results of Johansen's (1988) Fisher panel Cointegration test for all set of variables are reported in Tables 2A and 2B. We used the Akaike Information Criterion (AIC) and the Schwarz Information Criterion (SIC) to determine the optimal lag length that is equal to one. In Fisher panel Cointegration test, the number of cointegrating vectors is denoted by r_0; the trace test is calculated under the null hypothesis: $H_0: r_0 \leq r$ and the alternative hypothesis $H_1: r_0 > r$. The maximum eigenvalue test is calculated under the null hypothesis $H_0: r_0 = r$, and the alternative hypothesis $H_1: r_0 > r$. For each data set in each panel, the null hypothesis, $r_0 = 0$, is tested using the observed trace statistic and the max-eigen statistic , if the null hypothesis is rejected, then the null hypothesis $r_0 = 1$, is examined. The results show that the trace statistic and the max-eigen statistic of the null hypothesis $r_0 = 0$, ["none"] are statistically significant for all sets of variables, that's to say, the null hypothesis $r_0 = 0$, has been rejected at the 5% significance level, indicating that there is a co-integration relationship in the variable sequences. Therefore, the following pairs of variables: LRGDP & LREUEXP, LRGDP & LREUIMP, LRGDP & LREUXMG, LRGDP & LREUXTX, LRGDP & LREUMTM, LRGDP & LREUTRADE move together in the long run for each of the panels of EU traders with the ENP countries.

Table 2A. Johansen Fisher Panel Cointegration Test Results –Trade Openness Variables

Variables		Johansen Fisher Panel Cointegration Test			
		Fisher Statistics from Trace Test	P-value	Fisher Statistics from Max-Eigen Test	P-value
LRGDP & LREU27EXP	None	129.20**	0.0000	101.30**	0.0000
	At most 1	79.88	0.0000	79.88	0.0000
LRGDP & LREU27IMP	None	116.60**	0.0000	102.60**	0.0000
	At most 1	60.81	0.0003	60.81	0.0003
LRGDP & LREU27XMG	None	126.40**	0.0000	109.00**	0.0000
	At most 1	65.41	0.0001	65.41	0.0001
LRGDP & LREU12EXP	None	328.60**	0.0000	291.40**	0.0000
	At most 1	75.03	0.0000	75.03	0.0000
LRGDP & LREU12IMP	None	337.50**	0.0000	283.60**	0.0000
	At most 1	101.70	0.0000	101.70	0.0000
LRGDP & LREU12XMG	None	264.50**	0.0000	207.70**	0.0000
	At most 1	103.80	0.0000	103.80	0.0000
LRGDP & LREU7EXP	None	262.30**	0.0000	219.40**	0.0000
	At most 1	90.82	0.0000	90.82	0.0000
LRGDP & LREU7IMP	None	270.60**	0.0000	238.40**	0.0000
	At most 1	93.15	0.0000	93.15	0.0000
LRGDP & LREU7XMG	None	240.50**	0.0000	219.90**	0.0000
	At most 1	62.65	0.0002	62.65	0.0002
LRGDP & LREU8EXP	None	312.90**	0.0000	261.70**	0.0000
	At most 1	91.30	0.0000	91.30	0.0000
LRGDP & LREU8IMP	None	306.00**	0.0000	255.30**	0.0000
	At most 1	105.60	0.0000	105.60	0.0000
LRGDP & LREU8XMG	None	269.00**	0.0000	218.50**	0.0000
	At most 1	97.14	0.0000	97.14	0.0000

Note: Fisher statistic: asymptotic p-values are computed using x^2 distribution.

** indicates rejection of the null hypothesis of no cointegration at least at the 5% level of significance

Table 2B. Johansen Fisher Panel Cointegration Test Results – Trade Integration Variables

Variables		Johansen Fisher Panel Cointegration Test			
		Fisher Statistics from Trace Test	P-value	Fisher Statistics from Max-Eigen Test	P-value
LRGDP & LREU27XTX	None	103.70**	0.0000	91.06**	0.0000
	At most 1	58.08	0.0007	58.08	0.0007
LRGDP & LREU27MTM	None	118.50**	0.0000	101.40**	0.0000
	At most 1	65.00	0.0001	65.00	0.0001
LRGDP & LREU27TRADE	None	108.10**	0.0000	97.93**	0.0000
	At most 1	55.51	0.0015	55.51	0.0015
LRGDP & LREU12XTX	None	99.62**	0.0000	88.68**	0.0000
	At most 1	57.53	0.0008	57.53	0.0008
LRGDP & LREU12MTM	None	92.17**	0.0000	79.77**	0.0000
	At most 1	46.52	0.0154	46.52	0.0154
LRGDP & LREU12TRADE	None	347.70**	0.0000	310.90**	0.0000
	At most 1	110.50	0.0000	110.50	0.0000
LRGDP & LREU7XTX	None	74.02**	0.0000	59.71**	0.0004
	At most 1	51.47	0.0044	51.47	0.0044
LRGDP & LREU7MTM	None	107.00**	0.0000	97.40**	0.0000
	At most 1	45.16	0.0213	45.16	0.0213
LRGDP & LREU7TRADE	None	251.90**	0.0000	216.30**	0.0000
	At most 1	77.38	0.0000	77.38	0.0000
LRGDP & LREU8XTX	None	90.05**	0.0000	81.67**	0.0000
	At most 1	40.12	0.0645	40.12	0.0645
LRGDP & LREU8MTM	None	94.93**	0.0000	86.20**	0.0000
	At most 1	41.79	0.0454	41.79	0.0454
LRGDP & LREU8TRADE	None	366.80**	0.0000	307.30**	0.0000
	At most 1	107.40	0.0000	107.40	0.0000

Note: Fisher statistic: asymptotic p-values are computed using x^2 distribution.

** indicates rejection of the null hypothesis of no cointegration at least at the 5% level of significance

Hence, having concluded that there is a co-integration relationship or a long-run relationship between all pairs of data variables, i.e. real GDP and each of the Trade Openness/Integration indicators, at the next step, we estimate the long-run relationships- equations (4)-(5) as explained in Section 3.3., using dynamic ordinary least squares (DOLS) estimator proposed by Mark and Sul (2003). As mentioned earlier, the DOLS estimator corrects standard OLS for bias induced by endogeneity and serial correlation.

Tables 3A and 3B report the long-run estimates for the different panel pairs of data variables associated with the cointegrating vector procedure for the EU27, high, middle and low income EU 27 traders. Since all variables are in natural logarithms, the estimated long-run coefficients can be interpreted as elasticities.

In Table 3A, the coefficients of exports are positive and statistically significant at the 5% level for all four panels of EU trade partners. This finding is consistent with the export-led-growth hypothesis. Given that the coefficients can be interpreted as elasticity estimates, the result in the panel for the total exports to EU27, indicate that an increase of 1% in exports to EU27 increases real GDP by 0.534%. Regarding the high income EU trade partners the results indicate that a 1% increase in exports increases real GDP in ENPS countries by 0.381%. In the case of the middle income EU8 trade partners, the results show that a 1% increase in ENP exports increases real GDP by 0.373%; while the long-run parameter estimate for the low income EU trade partners shows that a 1% increase in exports increases real GDP in the ENP countries by 0.197%. One observes that the elasticity estimates with respect to exports becomes smaller as the income level associated with each panel of EU trade partners decreases.

Taking real exports as the dependent variable, exports also turns out to increase as real GDP grows in all four panels; it is worth noting however that the effect is greater when trading with lower income EU partners. More specifically, the long-run estimates reveal that for the low income EU trade partners a 1% increase in real GDP increase exports by 1.996%; while for the middle and high income trade partners the increase in exports is 1.172%, and 0.649% respectively.

The results indicate that the ability of ENP countries to export is greater in less advanced EU countries, where competition is not that strong by domestic producers, market entry requirements and standards not too high and consumer tastes similar. For example, the Southern EU States may have a greater appreciation (or taste) for Mediterranean products from Southern ENP countries and Central and East EU countries a better appreciation for products from Eastern ENP countries because of cultural or historical reasons. In addition, we have to take into consideration that distance plays a significant role in determining the export performance of ENP countries (Petrakos and Kallioras 2013). In that sense, it is reasonable to find that ENP counties have a better export performance in neighboring, rather than distant, markets.

The coefficients of imports are also positive and statistically significant at the 5% level for all four panels of EU trade partners, while the elasticity estimate with respect to imports once again becomes smaller as the income level associated with the panel decreases. This finding suggests that long-term economic growth of the ENP countries depends on the imports of capital goods and machinery which accelerates economic productivity. Recent endogenous growth models (see Grossman and Helpman, 1991; Lee, 1995; Mazumdar, 2001) have emphasized the importance of imports as an important channel for foreign technology and knowledge to flow into the domestic economy. New technologies could be embodied in imports of intermediate goods such as machines and equipment and labour productivity could increase over time as workers acquire the knowledge to 'unbundle' the new embodied technology (Thangavelu and Rajaguru, 2004). Furthermore, imports are an important factor in the countries whose manufacturing base is built on export oriented industries (Serletis, 1992; Riezman *et. al*, 1996). The economic growth is promoted by importing high quality goods and services, which in turn expand the production possibilities. Taking real imports as the dependent variable, imports also turn out to increase as real GDP grows in all four panels; again the estimated elasticity increases as the level of income of EU trade partners decreases.

As we have already stated in the case of imports, an important factor explaining the relation of higher elasticities to lower income groups may be geographical (and perhaps cultural or historical) proximity, in the sense that middle income EU countries (Southern EU members) are relatively closer to ENP-South and low level EU countries (NMS) are relatively closer to ENP-East.

Note, also, that import elasticities of GDP growth are systematically higher than export elasticities for any group of EU countries. This indicates that imports are important ingredients of the productive system of ENP countries, providing (among other things) machinery, equipment, supplies or intermediate products that may be missing in the domestic market.

Another interpretation of these findings may be that in the ENP countries with large populations and therefore large domestic demand, the export-base model of growth may not be the optimum choice, as developing domestic demand may be a more balanced approach.

The coefficients of the trade openness indicator defined as real exports plus real imports to real GDP is not statistically significant in all panels. The elasticity of the EU27 is negative but statistically insignificant. The coefficient in the panel of high income traders is negative and statistically significant indicating that an increase of 1% in LREU12XMG will decrease the real GDP of the ENP countries by 0.409%; while the long-run parameter estimates for both middle income and low income traders are positive and statistically significant revealing that an increase of 1% in LREU7XMG will increase real GDP by 0.306% and a 1% in LREU8XMG will increase the real GDP of the ENP countries by 0.347%. Based on these results, we observe that the expansion of trade with the EU stimulates economic growth in ENP countries when trading with EU members being closer or having a similar production structure to them (i.e. countries belonging to middle and low income EU members respectively). On the contrary, when the expansion of trade is related to the high income EU members, the impact on growth is negative. One explanation might be that a significant share of imports from EU12 is related to consumption and luxury products sectors (expensive cars, electronics, fashion items, etc, instead of machinery and equipment) that contribute to welfare, but do not contribute to growth. Another explanation can be that trade with EU12 countries may be very unbalanced (Petrakos et al 2013 - geography paper), contributing to un-sustained trade deficits that eventually obstruct long-term growth.

Taking the trade openness indicator as the dependent variable, it turns out that increases in real GDP has a negative impact on trade opening for the total sample of EU27 trade partners and EU12, and the elasticity is statistically significant. The elasticities however, become positive and statistically significant for the third and fourth panels of countries, i.e. EU7 and EU8 trade partners respectively. It is worth noting however that the effect is greater when trading with lower income EU partners. An interpretation of this finding is that growth of the ENP economies stimulates the expansion of exports and imports with all EU income groups, but not in the same way. For the advanced EU countries this expansion of trade relations has to be at a pace that is lower than the GDP growth rate, so that the (X+M)/GDP ratio eventually declines, while for the less advanced EU countries the expansion of trade relations has to be greater than the expansion of GDP, so that the (X+M)/GDP ratio in their case eventually increases.

Table 3A. Long-Run Elasticity Estimation Results-Trade Openness

	Dependent Variable: LRGDP				Independent Variable: LRGDP		
	Variable	*Coefficient*	*t-Statistic*			*Coefficient*	*t-Statistic*
Independent Variable	LREU27EXP	0.534**	13.063	Dependent Variable	LREU27EXP	0.909**	12.915
	LREU27IMP	0.555**	16.376		LREU27IMP	0.854**	10.037
	LREU27XMG	-0.209	-1.508		LREU27XMG	-0.034	-0.668
	LREU12EXP	0.381**	9.907		LREU12EXP	0.649**	7.356
	LREU12IMP	0.538**	14.409		LREU12IMP	0.904**	13.980
	LREU12XMG	-0.409**	-4.481		LREU12XMG	-0.167**	-2.930
	LREU7EXP	0.373**	11.738		LREU7EXP	1.172**	10.198
	LREU7IMP	0.390**	20.164		LREU7IMP	0.992**	15.469
	LREU7XMG	0.306**	4.236		LREU7XMG	0.278**	4.342
	LREU8EXP	0.197**	11.149		LREU8EXP	1.996**	15.557
	LREU8IMP	0.314**	15.253		LREU8IMP	1.480**	14.397
	LREU8XMG	0.347**	8.046		LREU8XMG	0.640**	6.093

Note: t-statistics are reported for each estimate; **denotes significance at the 5% .

Table 3B. Long-Run Elasticity Estimation Results-Trade Integration

	Dependent Variable: LRGDP				Independent Variable: LRGDP		
	Variable	*Coefficient*	*t-Statistic*			*Coefficient*	*t-Statistic*
Independent Variable	LREU27XTX	-0.338**	-5.518	Dependent Variable	LREU27XTX	-0.145**	-2.467
	LREU27MTM	-0.304**	-2.471		LREU27MTM	-0.079**	-2.067
	LREU27TRADE	-0.496**	-3.703		LREU27TRADE	-0.165**	-4.611
	LREU12XTX	-0.370**	-12.017		LREU12XTX	-0.334**	-5.070
	LREU12MTM	-0.464**	-4.105		LREU12MTM	-0.211**	-5.130
	LREU12TRADE	-0.541**	-6.481		LREU12TRADE	-0.245**	-6.525
	LREU7XTX	0.015	0.187		LREU7XTX	-0.001	-0.014
	LREU7MTM	0.221**	3.548		LREU7MTM	0.325**	4.287
	LREU7TRADE	0.227**	2.151		LREU7TRADE	0.287**	4.510
	LREU8XTX	0.134**	5.229		LREU8XTX	1.029**	7.224
	LREU8MTM	0.313**	9.332		LREU8MTM	0.486**	5.144
	LREU8TRADE	0.315**	6.083		LREU8TRADE	0.510**	5.450

Note: t-statistics are reported for each estimate; **denotes significance at the 5% .

This may be an indication that the development priorities of ENP countries are better served by expanding trade relations with the middle-low EU member states, faster than trade relations with the advanced ones. One reason for that may be that ENP-EU12 trade relations have already been expanded to levels that cannot be justified by the 'production curve' of these countries and a gradual adjustment may be necessary.

The trade integration elasticities in Table 3B reveal another aspect of the internationalization experience of the ENP countries. These elasticities estimate the impact of greater integration, that is, the impact of a greater *relative* expansion of exports, imports or trade with the EU as a whole, or each one of the EU income groups on ENP GDP growth. We observe that all three trade integration measures appear with estimated elasticities for the EU27 and the high income EU12 countries that are negative and statistically significant; indicating that deeper trade integration with the advanced EU countries may have a negative impact on ENP countries GDP growth. At the same time, deeper trade integration with the middle and lower income EU member states (i.e. EU7 and EU 8 respectively) appears to have a positive and statistically significant impact on real GDP of the ENP countries. Again the impact is greater for trade with the lower income EU countries. These results indicate that at current levels of EU-ENP trade relations, deeper integration with the EU is beneficial for ENP economic growth only to the extent that it is based on a faster expansion of ENP trade relations with the EU Southern and Central-Eastern member states that have a greater potential for a balanced and mutually beneficial integration in geographical, historical and economic terms.

When real GDP is taken as an independent variable in our long run relationship, the results indicate that economic growth in ENP countries favours weaker trade integration with the advanced EU12 countries and deeper trade integration with the middle (EU7) and especially the lower (EU 8) income EU countries. For reasons that have already been discussed, these findings also suggest that ENP growth is more compatible with trade relations that expand in a geographically and structurally more balanced way.

4.4. Dynamic Panel Causality

The question of long-run causal relationship between trade openness and integration indicators on the one hand and GDP growth on the other is now examined more thoroughly with the use of panel vector error correction models. Defining the lagged residuals (η, ϕ) from the estimated long-run cointegration equations (6)-(7), the dynamic error correction models are estimated for the different data variable-sets.

The estimated results are presented in Tables 6A and 6B. The optimal lag structure of one year is chosen using Schwarz Bayesian and Akaike Information Criteria. Short-run causality is determined by the statistical significance of the estimated coefficients of the first differences of variables. Long-run causality is determined by the statistical significance of the respective error correction terms using t-tests. The left-hand side columns of the Tables 4A and 4B explore the dynamics of trade on GDP growth and contain the results with reference to equation (6), while the right-hand side columns investigate the other direction of causality and are consequently based on equation (7). In the same tables we can observe the results for the total sample of countries as well as for the three subpanels.

The coefficients of the error-correction term give the adjustment rate at which short-run dynamics converge to the long-run equilibrium relationship. In our specification, it is the adjustment rate at which the gap between trade and growth is closed. Generally, all these coefficients are negative and highly significant as expected, so the results show that there exists a long-run relationship between the different sets of pairs of variables for all four panels. As expected the error correction coefficient implies that when there are deviations from long-run equilibrium, short run adjustments in trade will re-establish long-run equilibrium. The absolute value of the term provides the speed of the short-run adjustment process indicating percentage of the discrepancy which is corrected in each period.

More specifically, our empirical exercise reveals the following interesting points:

a) From the results of Table 4A, we have found two bidirectional causalities: real volume of exports causes real GDP and vice versa and also real volume of imports causes real GDP and vice versa in the panels of EU 27, EU12 and EU7. This finding verifies that the exports and imports are crucial and significantly beneficial to the growth of GDP when trading with the high and middle income EU traders.
b) Furthermore there are exist the following unidirectional causalities: trade openness (ΔLRXMG) causes real GDP when trading with the EU8 and EU7; while there is no causality between the same variables at all in any direction for the panels of EU27 and EU12.
c) In general, the speed of adjustment towards long-run equilibrium is rather slow given the magnitude of the coefficients of the error correction terms, ranging from 12.19 years to 4.42 (The speed of adjustment is computed as the reciprocal of the absolute value of the respective error correction terms.)

d) Concerning the second set of variables (trade integration indicators) for the four panels of countries, there exist a unidirectional causality from ΔLREUXTX to ΔLRGDP for the panels of EU27, EU12 traders.

e) There exist no causality in any direction between ΔLREUMTM and ΔLRGDP as well as between ΔLREUTRADE and ΔLRGDP for neither of the panels of EU 27 or EU12 traders, while there exist a unidirectional causality between ΔLREUMTM and ΔLRGDP as well as between ΔLREUTRADE and ΔLRGDP for the panels of EU 8 and EU7 traders.

f) Finally, there exists a unidirectional causality between to ΔLRGDP and ΔLREUXTX for the panel of EU8 trading partners. In all cases, and in terms of the long-run dynamics, based on the statistical significance of the error corrections terms all variables respond to deviations from long-run equilibrium in all four panels.

The above results would appear to indicate that the link from trade to real GDP is stronger than the reverse link and it is stronger when trading with middle and low income EU partners. Nevertheless, trade relations with the EU12 cannot be discarded. Interestingly, however, the results become far more pronounced when we look at the trade openness results as well as trade integration results at the EU 7 and EU 8 panels, trade causes real GDP whether this causality does not hold for the higher income EU traders. This is in line with Harrison (1996) who argues that although more open trade policies do precede higher growth rates, it is also true that higher growth rates lead to more open trade regimes. Of particular interest for our discussion in the VECM is the parameters of the ECT indicating the speed of adjustment to the long-run cointegrating equations. It is found that the adjustment speed is greater for shocks running from trade to real GDP at the panels of lower income EU traders.

Table 4A. Panel VECM Estimation Results

Dependent Variable			Coefficient	t-Statistic	Dependent Variable			Coefficient	t-Statistic	Direction of Causality
ΔLRGDP	SR	ΔLREU27EXP	0.049**	4.117	ΔLREU27EXP	SR	ΔLRGDP	1.277**	3.446	ΔLREU27EXP <=> ΔLRGDP
	LR	ECT	-0.123**	-8.014		LR	ECT	-1.102**	-10.336	
ΔLRGDP	SR	ΔLREU27IMP	0.109**	5.484	ΔLREU27IMP	SR	ΔLRGDP	0.588**	2.525	ΔLREU27IMP <=> ΔLRGDP
	LR	ECT	-0.233	-7.955		LR	ECT	-0.985**	-11.288	
ΔLRGDP	SR	ΔLREU27XMG	-0.030	-1.277	ΔLREU27XMG	SR	ΔLRGDP	0.308	1.167	NONE
	LR	ECT	-0.082**	-5.858		LR	ECT	-0.863**	-9.177	
ΔLRGDP	SR	ΔLREU12EXP	0.024**	2.242	ΔLREU12EXP	SR	ΔLRGDP	1.592**	3.811	ΔLREU12EXP <=> ΔLRGDP
	LR	ECT	-0.123**	-8.403		LR	ECT	-1.087**	-11.170	
ΔLRGDP	SR	ΔLREU12IMP	0.072**	4.407	ΔLREU12IMP	SR	ΔLRGDP	1.203**	4.968	ΔLREU12IMP<=> ΔLRGDP
	LR	ECT	-0.226	-9.531		LR	ECT	-0.772**	-9.687	
ΔLRGDP	SR	ΔLREU12XMG	-0.035	-1.466	ΔLREU12XMG	SR	ΔLRGDP	0.496	1.626	NONE
	LR	ECT	-0.080**	-4.668		LR	ECT	-0.943**	-10.084	
ΔLRGDP	SR	ΔLREU7EXP	0.042**	4.073	ΔLREU7EXP	SR	ΔLRGDP	1.301**	4.967	ΔLREU7EXP <=> ΔLRGDP
	LR	ECT	-0.121**	-8.087		LR	ECT	-1.103**	-20.516	
ΔLRGDP	SR	ΔLREU7IMP	0.083**	5.430	ΔLREU7IMP	SR	ΔLRGDP	0.367**	3.568	ΔLREU7IMP <=> ΔLRGDP
	LR	ECT	-0.185**	-7.684		LR	ECT	-0.686**	-9.575	
ΔLRGDP	SR	ΔLREU7XMG	0.046**	4.507	ΔLREU7XMG	SR	ΔLRGDP	-0.031	-0.101	ΔLREU7XMG => ΔLRGDP
	LR	ECT	-0.109**	-8.411		LR	ECT	-1.044**	-12.673	
ΔLRGDP	SR	ΔLREU8EXP	0.009	1.485	ΔLREU8EXP	SR	ΔLRGDP	-0.993	-1.368	NONE
	LR	ECT	-0.124**	-6.886		LR	ECT	-0.843**	-9.184	
ΔLRGDP	SR	ΔLREU8IMP	0.060**	6.911	ΔLREU8IMP	SR	ΔLRGDP	1.110**	2.290	ΔLREU8IMP <=> ΔLRGDP
	LR	ECT	-0.144**	-7.351		LR	ECT	-0.729	-8.999	
ΔLRGDP	SR	ΔLREU8XMG	0.028**	3.601	ΔLREU8XMG	SR	ΔLRGDP	-0.532	-1.103	ΔLREU8XMG => ΔLRGDP
	LR	ECT	-0.100**	-6.640		LR	ECT	-0.807**	-8.814	

Note: ECT represents the coefficient of the error correction terms: η, ϕ respectively; t-statistics are reported for each estimate; **denotes significance at the 5%; Potential heteroskedasticity of the error terms is corrected by using White robust standard errors.SR stands for short run; LR stands for long run.

We observe that the causality from trade to GDP is stronger than the causality from GDP to trade, indicating that trade with the EU as a whole and each one of the income sub-groups is a long-term driver of growth for the ENP countries. However, the results indicate that there are some *limits* to the benefits of trade expansion. We observe that increases in the value of trade as a share of GDP contribute to long-term growth only in the case of ENP relations with the middle and low income EU county groups (EU7 and EU8). This result is in line with previous findings that at the current levels of EU-ENP trade relations, the relative expansion of trade (as a share of GDP) with the advanced EU countries does not seem to contribute to ENP long-term growth.

Table 4B. Panel VECM Estimation Results

Dependent Variable			Coeff.	t-Stat.	Dependent Variable			Coeff.	t-Stat.	Direction of Causality
ΔLRGDP	SR	ΔLREU27XTX	-0.056**	-2.933	ΔLREU27XTX	SR	ΔLRGDP	0.245	1.582	ΔLREU27XTX => ΔLRGDP
	LR	ECT	-0.110**	-6.722		LR	ECT	-0.970**	-10.216	
ΔLRGDP	SR	ΔLREU27MTM	0.016	1.476	ΔLREU27MTM	SR	ΔLRGDP	0.026	0.145	NONE
	LR	ECT	-0.139**	-13.242		LR	ECT	-0.656**	-8.384	
ΔLRGDP	SR	ΔLREU27TRADE	-0.015	-0.812	ΔLREU27TRADE	SR	ΔLRGDP	0.113	1.319	NONE
	LR	ECT	-0.109**	-7.039		LR	ECT	-0.926**	-9.714	
ΔLRGDP	SR	ΔLREU12XTX	-0.050**	-3.029	ΔLREU12XTX	SR	ΔLRGDP	0.210	0.810	ΔLREU12XTX => ΔLRGDP
	LR	ECT	-0.121**	-6.315		LR	ECT	-1.028**	-11.045	
ΔLRGDP	SR	ΔLREU12MTM	-0.028**	-2.266	ΔLREU12MTM	SR	ΔLRGDP	-0.011	-0.078	ΔLREU12MTM => ΔLRGDP
	LR	ECT	-0.107**	-7.371		LR	ECT	-0.870**	-11.463	
ΔLRGDP	SR	ΔLREU12TRADE	-0.026	-1.419	ΔLREU12TRADE	SR	ΔLRGDP	0.110	1.133	NONE
	LR	ECT	-0.112**	-5.795		LR	ECT	-1.057**	-13.556	
ΔLRGDP	SR	ΔLREU7XTX	0.014	1.449	ΔLREU7XTX	SR	ΔLRGDP	0.229	0.534	NONE
	LR	ECT	-0.103**	-9.421		LR	ECT	-0.960**	-12.911	
ΔLRGDP	SR	ΔLREU7MTM	0.041**	6.129	ΔLREU7MTM	SR	ΔLRGDP	-0.183	-0.504	ΔLREU7MTM => ΔLRGDP
	LR	ECT	-0.099**	-6.291		LR	ECT	-0.830**	-9.966	
ΔLRGDP	SR	ΔLREU7TRADE	0.037**	2.993	ΔLREU7TRADE	SR	ΔLRGDP	0.139	0.490	ΔLREU7TRADE => ΔLRGDP
	LR	ECT	-0.092**	-6.549		LR	ECT	-1.057**	-11.551	
ΔLRGDP	SR	ΔLREU8XTX	0.000	0.048	ΔLREU8XTX	SR	ΔLRGDP	-1.561**	-2.642	ΔLREU8XTX <= ΔLRGDP
	LR	ECT	-0.082**	-6.497		LR	ECT	-0.808**	-8.233	
ΔLRGDP	SR	ΔLREU8MTM	0.032**	2.512	ΔLREU8MTM	SR	ΔLRGDP	0.473	1.321	ΔLREU8MTM => ΔLRGDP
	LR	ECT	-0.103**	-5.195		LR	ECT	-0.979**	-9.988	
ΔLRGDP	SR	ΔLREU8TRADE	0.037**	4.046	ΔLREU8TRADE	SR	ΔLRGDP	-0.383	-1.141	ΔLREU8TRADE => ΔLRGDP

LR	ECT	-0.084**	-6.707	LR	ECT	-0.759**	-7.862

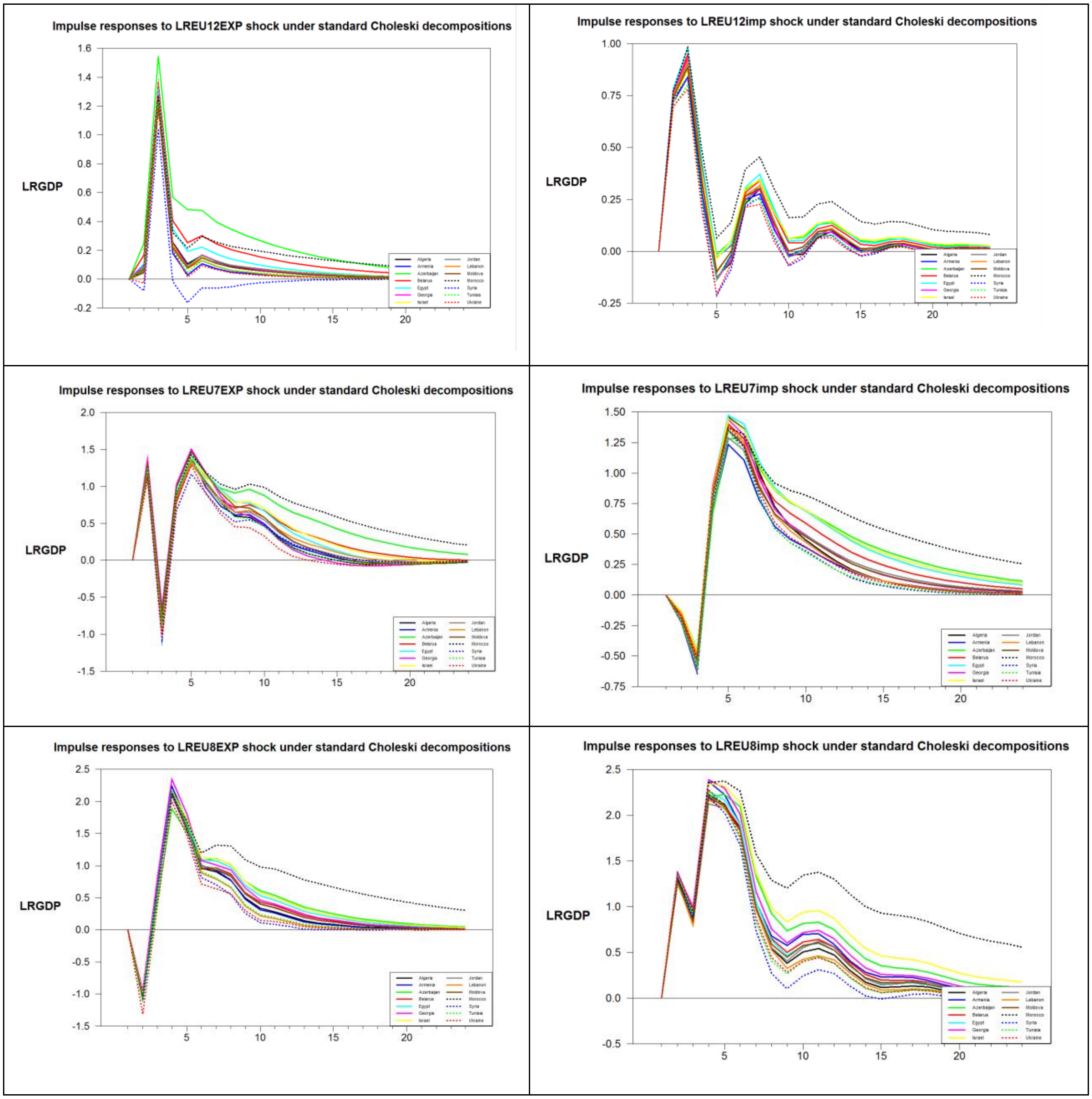
Note: ECT represents the coefficient of the error correction terms: η, ϕ respectively; t-statistics are reported for each estimate; *denotes significance at the 5%; Potential heteroskedasticity of the error terms is corrected by using White robust standard errors.SR stands for short run; LR stands for long run.

4.5. Impulse Response Analysis

In order to understand the reaction of the real GDP or change in real GDP to the innovation in another variable, we set up a Bayesian Panel Vector Autoregression (PVAR) model as explained in section 3.4, and perform an impulse response analysis. To draw a comparison with the Granger non-causality test, we estimate the model as proposed in section 3.4, but all the coefficients are allowed to vary only across units and not across time. The impulse response functions are plotted in Graphs 1A to 1C.

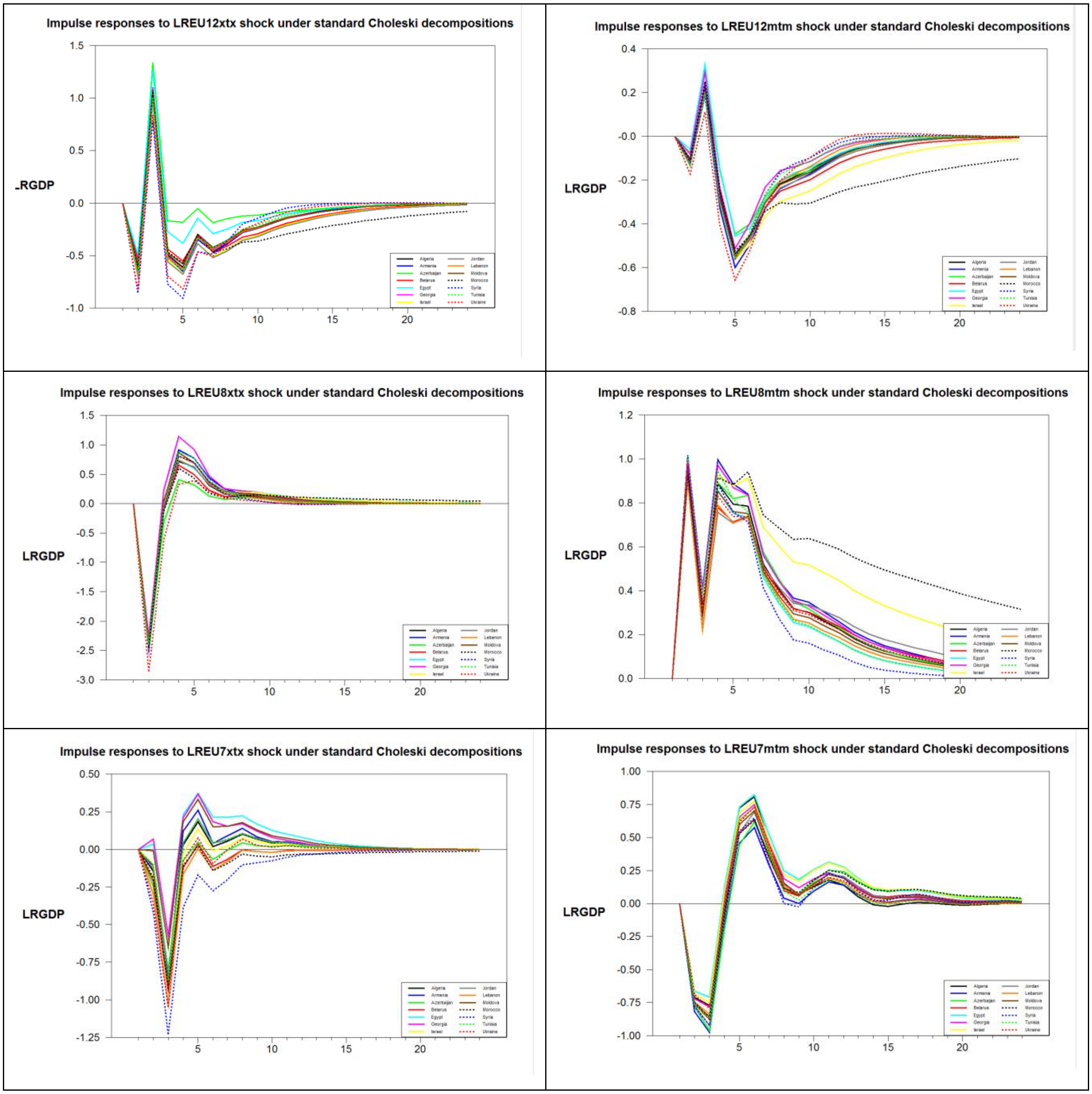
The graphs shows that the response of real GDP to the change in exports' shocks causes real GDP to jump at the beginning and to die out quickly to the long-run value after 6 time periods for the panel of EU 12 and EU7 traders, while for the panel of EU8 the initial impact is negative followed by a sharp positive increase. In the case of the imports, the responses of real GDP to the changes of real imports' shocks causes real GDP to increase initially slowing down after 3 time periods when trading with the EU12 and EU8, the exact opposite effect is observed in the case of EU7 trading partners. In the case of the response of the change in ΔLRXTX variable, changes in ΔLRXTX causes real GDP to decrease initially, followed by a sharp increase and dying to the long run equilibrium after approximately 2 time periods. The sharpest impact is observed in the case of EU8 trade partners. Furthermore, and in the case of ΔLRMTM, real GDP responds initially in a negative way to shocks of ΔLRMTM when trading with EU7 and EU12, with greater on average impact found in EU8. Finally, observing the trade integration indicators' shock's impact on real GDP, we note that the response of the change in ΔLRTRADE variable causes real GDP to decrease initially, followed by a sharp increase and dying to the long run equilibrium after approximately 4 time periods. The greater and fastest on average affect is observed in the low income panel EU 8 traders. These results are consistent and parallel to the panel Granger non-causality tests.

Graph 1A. Shrinkage IRF's – VAR

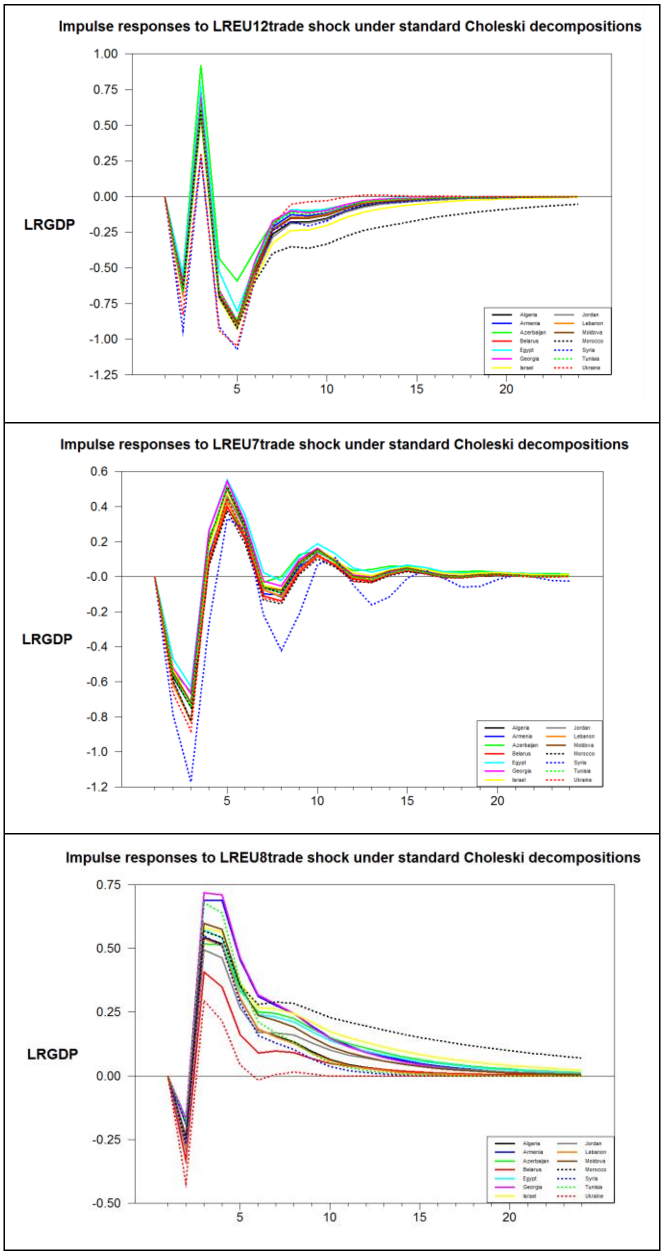


It becomes clear in diagrams 1A-1C that the area defined by the impulse curve and the horizontal axis presents the net long-term impact of the relevant trade indicator on GDP growth. After subtracting negative from positive values, it becomes clear that exports and imports with the middle and low income EU countries have a potentially greater long-term impact on ENP GDP growth. It also becomes clear that the *relative* expansion of trade with the EU has an overall negative impact on ENP growth when it concerns advanced EU countries and an overall positive impact when it concerns the low income EU countries. The expansion of relative trade with the middle income EU countries has a mixed (and unclear) impact that largely depends on the performance of each individual ENP country.

Graph 1B. Shrinkage IRF's – VAR



Graph 1C. Shrinkage IRF's – VAR



6. Conclusions

This paper has used Panel Unit Root Tests, Panel Cointegration analysis, Dynamic Panel Causality test and a Panel VAR Methodology in order to test for the long-term impact of trade with the EU on ENP growth. The results of the analysis indicate that exports and imports to/from the EU contribute to growth, providing some support in favor of mainstream theories of trade and development. However, when the analysis is expanded to include indicators of trade openness and trade integration and the panel of data is divided to estimate the effects of trade with different EU economic sub-groups, these results become conditional and a new set of robust findings arises, with serious implications for theory and policy.

In terms of *trade openness*, the analysis has shown that trade expansion with the EU contributes to ENP growth mainly when it concerns trade with the middle and low income EU members, that is, the Southern and the Central-Eastern EU members. In their case, the expansion of trade as a share of GDP is beneficial for ENP growth. On the contrary, when the expansion of trade as a share of GDP is related to the high income EU members, the impact on growth is negative. The analysis also shows that with existing productive capacities and structures, ENP GDP growth stimulates the expansion of trade relations as a share of GDP only with the middle and low level of income EU member states.

When the analysis uses *trade integration* indicators, the results are similar. They show that deeper trade integration with the advanced EU countries may have a negative impact on ENP countries GDP growth. At the same time, deeper trade integration with the middle and lower income EU member states appears to have a positive and statistically significant impact on real GDP of the ENP countries. The results also indicate that, under existing production capabilities, economic growth in ENP countries favours weaker trade integration with the advanced EU countries and deeper trade integration with the middle and especially the lower income EU countries.

The dynamic causality tests that follow, broadly speaking, verify these results, as they find *limits* to the benefits of trade expansion. At the current levels of EU-ENP trade relations, the relative expansion of trade (as a share of GDP) with the less advanced EU countries seems to contribute to ENP long-term growth, while the expansion with the advanced ones it does not.

Similar findings are reported when we use a panel VAR methodology, which shows that the *relative* expansion of trade with the EU has an overall negative impact on ENP growth when it concerns advanced EU countries and an overall positive impact when it concerns the low income EU countries.
These results cast some doubt on the mainstream win-win models of trade and development and provide support to alternative theories relating trade outcomes on structural and development gaps, initial conditions, market size, scale effects and geographical coordinates.

The findings of this paper have two important messages for the theory of international trade. First, they indicate that trade among 'unequal partners' can be beneficial for the growth of developing or emerging economies only when it takes place within some *limits* that should not be exceeded. The ENP trade with the advanced EU economies should be an important part of their total trade, but it should not dominate their overall trade relations. This trade is typically unbalanced and asymmetric (Petrakos et al 2013) and locks-in their exports in sectoral specializations that do not allow for a diversification of their productive base (Boschma 2013) that would be necessary for long-term growth.

Second, they indicate that the geographical allocation of trade relations affects in an important way the growth potential of the developing or emerging economies in the external European periphery. A more balanced allocation of trade; improving the participation of EU countries that are in many ways *closer* to ENP countries is found to have a positive and systematic impact on long-term ENP growth. It appears that finding trade partners with a geographical, but also economic and cultural *proximity* is a necessary ingredient for a successful integration experience for ENP countries. The development of trade among *neighbours* (which is the dominant pattern among the advanced EU countries) along the EU-ENP frontiers appears to be critical in order to balance the (otherwise necessary within reasonable limits) core-periphery trade.

The results of this analysis challenge the mainstream understanding of the external EU trade relations, where the same model of liberalization, openness and integration that has been used for the successive rounds of EU integration is now used for the development of trade relations with the ENP. The idea that international trade is always beneficial for all parts involved, no matter who the trade partners are, what mix of products are traded and if trade is balanced or not, needs to be reexamined. Consequently, the idea that the EU can integrate to its core productive system successive homocentric rounds of geographically more and more dispersed and economically less and less developed areas without altering the basic model of integration and without incurring any costs for anyone, needs to be re-examined also.

This model has produced prosperity in the EU for more than three decades. However, it has also produced an unequal allocation of costs and benefits of trade and serious discrepancies in trade balances and trade structures that are to some extent responsible for the current economic crisis.

The results of the analysis indicate that at current levels of EU-ENP trade relations, the development priorities of ENP countries are better served by expanding trade relations with the middle-low EU member states, faster than trade relations with the advanced ones. Therefore, the current mix of trade relations needs to be re-examined in order to secure that trade with the EU contributes to ENP growth as much as possible. This may be an urgent assignment in the face of the evidence that the EU-ENP trade is declining over time, as new competitors, especially in Asia, arise (Petrakos et al 2013).

The EU policy towards ENC needs to obtain a deeper level of understanding of the interactions between trade relations and development prospects in both sides of the external borders. Moving one step away from the current policy doctrine, one may ask what type of trade arrangements may be able to improve the productive base and the growth prospects of the external and the internal EU periphery. A geographically more balanced EU-ENP integration may also lead to a more balanced development within the EU. Helping the EU South and the EU East (that is the internal EU periphery) to establish deeper and broader economic relations with the ENP South and the ENP East (that is the external EU periphery) is a feasible way to support growth in the (hit by the crisis) internal European periphery and promote EU cohesion.

Clearly, the EU policy makers would have a real difficulty to translate these findings into policy action. However, the bilateral character of EU trade agreements with each ENP country suggests that this may not be an 'impossible' task. Once policy makers understand that from the perspective of each country trade mix maters and not all forms of trade are mutually beneficial, there are some degrees of freedom for policy action. One line of policy action may suggest that (the celebrated) horizontal or 'one-size-fits-all' trade policies need to be carefully scrutinized when applied to a diverse, heterogeneous or unequal group of trade partners. This policy, however, has a limited room for success, if not combined with proactive industrial and development policies.

The EU has an expertise in development policies and has also gained some experience (and drawn some lessons) from the early stages of restructuring in transition countries. What is really needed is the will to allocate sufficient and largely unconditional resources for their implementation. These policies will help to develop cross-border multiplier effects that will be mutually beneficial for both sides of the external borders of the EU, promoting at the same time a balanced EU-ENP integration and a balanced intra-EU development.

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Appendix I. Cointegration Tests

Pedroni (Engle-Granger based) Cointegration Tests

The Engle-Granger (1987) cointegration test is based on an examination of the residuals of a spurious regression performed using I(1) variables. If the variables are cointegrated then the residuals should be I(0). On the other hand if the variables are not cointegrated then the residuals will be I(1). Pedroni (1999, 2004) and Kao(1999) extend the Engle-Granger framework to tests involving panel data.

Pedroni proposes several tests for cointegration that allow for heterogeneous intercepts and trend coefficients across cross sections, performing the following regression:

$$y_{it} = \alpha_i + \delta_i t + \beta_{1i} x_{1i,t} + \beta_{2i} x_{2i,t} + \ldots + \beta_{Mi} x_{Mi,t} + e_{i,t} \quad (3)$$

For $t = 1,\ldots,T$; $i = 1,\ldots,N$, $m = 1,\ldots,M$; where y and x are assumed to be integrated of order one, e.g. I(1). The parameters α_i and δ_i are individual and trend effects, which may be set to zero if desired.

Under the null hypothesis of no cointegration, the residuals $e_{i,t}$ will be I(1). The general approach is to obtain residuals from Eq.(3) and then to test whether residuals are I(1) by running the auxiliary regression:

$$e_{i,t} = \rho_i e_{i,t-1} + u_{i,t} \quad (4)$$

or

$$e_{i,t} = \rho_i e_{i,t-1} + \sum_{j=1}^{\rho} \psi_{i,j} \Delta e_{i,t-j} + v_{i,t} \quad (5)$$

for each cross-section. Pedroni describes various methods of constructing statistics for testing for null hypothesis of no cointegration ($\rho_i = 1$). There are two alternative hypotheses: the homogenous alternative, $(\rho_i = \rho) < 1$ for all i (which Pedroni terms the within-dimension test or panel statistics test), and the heterogeneous alternative, $\rho_i < 1$ for all i ((also referred to as the between-dimension or group statistics test).

In his approach, he considers seven different test statistics, four of which are based on pooling the residuals of the regression along the within-dimension of the panel, and the other three are based on pooling the residuals along the between-dimension of the panel. In both cases, the basic approach is first to estimate the hypothesized cointegrating relationship separately for each panel member and then to pool the resulting residuals for conducting the panel sets. Pedroni's heterogeneous panel Cointegration tests are only able to indicate whether or not the variables are cointegrated and if a long run relationship exists between them; however, they do not indicate the direction of causality when the variables are cointegrated. Details for these calculations are provided in the original papers.

Kao (Engle-Granger based) Cointegration Tests

The Kao test follows the same basic approach as the Pedroni tests, but specifies cross-section specific intercepts and homogeneous coefficients on the first-stage regressors. In the bivariate case described in Kao (1999), we have:

$$y_{i,t} = \alpha_i + \beta x_{i,t} + e_{i,t} \tag{6}$$

for

$$y_{i,t} = y_{i,t-1} + u_{i,t} \tag{7}$$

$$x_{i,t} = x_{i,t-1} + \varepsilon_{i,t} \tag{8}$$

for $t = 1,...,T$; $i = 1,..., N$. More generally, we may consider running the first stage regression Eq. (3), requiring the α_i to be heterogeneous, β_i to be homogeneous across cross-sections, and setting all of the trend coefficients δ_i to zero. Kao then runs either the pooled auxiliary regression:

$$e_{i,t} = \rho_i e_{i,t-1} + u_{i,t} \tag{9}$$

or the augmented version of the pooled specification,

$$e_{i,t} = \bar{\rho}_i e_{i,t-1} + \sum_{j=1}^{\rho} \psi_{i,j} \Delta e_{i,t-j} + v_{i,t} \tag{10}$$

Under the null of no cointegration, Kao shows that the augmented version ADF test statistic for $\rho > 0$ is:

$$ADF = \frac{t_p + \sqrt{6N\hat{\sigma}_v} /(2\hat{\sigma}_{0v})}{\sqrt{\hat{\sigma}_{ov}^2 /(2\hat{\sigma}_v^2) + 3\hat{\sigma}_v^2 /(10\hat{\sigma}_{ov}^2)}} \tag{11}$$

which converges to $\mathrm{N}(0,1)$ asymptotically.

Fisher-Johansen Combined Individual Tests

Fisher (1932) derives a combined test that uses the results of the individual independent tests. Maddala and Wu (1999) use Fisher's result to propose an alternative approach to testing for cointegration in panel data by combining tests from individual cross-sections to obtain at test statistic for the full panel. If π_i is the p-value from an individual cointegration test for cross-section i , then under the null hypothesis for the panel:

$$-2\sum_{i=1}^{N} \log(\pi_i) \rightarrow \chi^2 2N \tag{12}$$

χ^2 values based on MacKinnon-Haug-Michelis (1999) p-values for Johansen's cointegration trace and maximum eigenvalue tests are reported.

Appendix II. Panel Unit Root Test Results

Table II.1.(a). Panel Unit root Test Results-Trade Openness Variables

Unit Root Test Results		Levels				1st differences			
Variable		LLC Test	IPS Test	BRTG Test	ADF-Fisher Test	LLC Test	IPS Test	BRTG Test	ADF-Fisher Test
	Statistic	-2.841**	0.677	2.432	27.772	-3.917**	-2.311**	-0.481**	45.840**
LRGDP	Prob.**	0.002	0.751	0.993	0.477	0.000	0.010	0.000	0.018
	Statistic	-5.141**	-1.076	-2.337**	35.047	-3.751**	-3.980**	-0.834**	66.947**
LREU27EXP	Prob.**	0.000	0.141	0.010	0.169	0.000	0.000	0.000	0.000
	Statistic	-3.771**	-0.137	-1.995**	29.393	-11.053**	-3.444**	-3.385**	67.398**
LREU27IMP	Prob.**	0.000	0.445	0.023	0.393	0.000	0.000	0.000	0.000
	Statistic	-4.0076**	-1.6026	-3.6757**	37.4083	-6.3860**	-1.9390**	-0.6078**	56.0178**
LREU27XMG	Prob.**	0.0000	0.0545	0.0001	0.1101	0.0000	0.0262	0.0000	0.0013
	Statistic	-4.161**	-0.426	-1.327	28.579	-3.905**	-1.110	-0.367**	44.418**
LREU12EXP	Prob.**	0.000	0.335	0.092	0.434	0.000	0.134	0.000	0.025
	Statistic	-6.796**	-1.706	-1.169	44.877**	-6.663**	-1.282	-1.082**	46.460**
LREU12IMP	Prob.**	0.000	0.044	0.121	0.023	0.000	0.100	0.000	0.016
	Statistic	0.093	-1.171	-1.832**	15.464	-6.141**	-1.917**	-0.505**	56.731**
LREU12XMG	Prob.**	0.537	0.121	0.034	0.973	0.000	0.028	0.000	0.001
	Statistic	-4.506**	-0.888	-0.813	34.966	-10.131**	-3.178**	-4.058**	68.411**
LREU7EXP	Prob.**	0.000	0.187	0.208	0.171	0.000	0.001	0.000	0.000
	Statistic	-7.518**	-4.191**	-0.593	64.688	-7.760**	-2.752**	-0.904**	67.609**
LREU7IMP	Prob.**	0.000	0.000	0.277	0.000	0.000	0.003	0.000	0.000
	Statistic	-2.628**	-1.215	-1.189	35.825	-8.400**	-5.826**	-2.416**	90.554**
LREU7XMG	Prob.**	0.004	0.112	0.117	0.147	0.000	0.000	0.000	0.000
	Statistic	-6.061**	-1.270	-1.974	35.023	-7.007**	-1.296	-1.814**	45.871**
LREU8EXP	Prob.**	0.000	0.102	0.024	0.169	0.000	0.097	0.000	0.018
	Statistic	-0.811	0.506	-1.079	23.320	-9.610**	-3.964**	-3.832**	71.332
LREU8IMP	Prob.**	0.209	0.693	0.140	0.717	0.000	0.000	0.000	0.000
	Statistic	-5.580**	-1.229	-2.233	34.895	-11.036**	-3.850**	-3.664**	72.109**
LREU8XMG	Prob.**	0.000	0.110	0.013	0.173	0.000	0.000	0.000	0.000

Note: LLC, Breitung IPS, ADF-Fisher tests examine the null hypothesis of non-stationarity, and ** indicates statistical significance at the 5% level. The lag length is selected using the modified Schwarz Information Criteria.

Table II.1.(b). Panel Unit root Test Results-Trade Integration Variables

Unit Root Test Results		**Levels**				**1st differences**			
Variable		LLC Test	IPS Test	BRTG Test	ADF-Fisher Test	LLC Test	IPS Test	BRTG Test	ADF-Fisher Test
	Statistic	-6.4090**	-1.7096	-0.9316	43.5764	-9.4193**	-4.0511**	-2.4251**	83.1398**
LREU27XTX	Prob.**	0.0000	0.0437	0.1758	0.0306	0.0000	0.0000	0.0000	0.0000
	Statistic	-6.143**	-1.076	1.512	39.104	-8.720**	-2.822**	-1.871**	59.830**
LREU27MTM	Prob.**	0.000	0.141	0.935	0.079	0.000	0.002	0.000	0.000
	Statistic	-5.465**	-1.196	-1.238	35.553	-8.958**	-3.788**	-2.686**	75.763**
LREU27TRADE	Prob.**	0.000	0.116	0.108	0.154	0.000	0.000	0.000	0.000
	Statistic	-4.0585**	-0.8901	1.7330	34.6053	-6.2108**	-2.3058**	-3.5663**	62.6720**
LREU12XTX	Prob.**	0.0000	0.1867	0.9584	0.1816	0.0000	0.0106	0.0000	0.0002
	Statistic	-2.819**	-0.018	1.052	28.658	-3.372**	-2.659**	-1.257**	52.846**
LREU12MTM	Prob.**	0.002	0.493	0.854	0.430	0.000**	0.004	0.000	0.003
	Statistic	-4.540**	-0.571	1.729	33.843	-4.835**	-1.556**	-2.559**	49.688**
LREU12TRADE	Prob.**	0.000	0.284	0.958	0.206	0.000	0.060	0.000	0.007
	Statistic	-0.492	-1.528	-0.347	19.182	-5.907**	-1.879**	-0.360**	55.349**
LREU7XTX	Prob.**	0.311	0.063	0.364	0.892	0.000	0.030	0.000	0.002
	Statistic	-2.509**	0.380	0.397	24.950	-3.391**	-2.867**	0.144**	53.249**
LREU7MTM	Prob.**	0.006	0.648	0.654	0.631	0.000	0.002	0.000	0.003
	Statistic	-2.696**	-1.256	-1.300	36.138	-7.113**	-1.948**	-0.141	58.435
LREU7TRADE	Prob.**	0.004	0.105	0.097	0.139	0.000	0.026	0.000	0.001
	Statistic	-1.142	0.546	-2.130	23.088	-5.384**	-3.391**	-1.879**	59.610**
LREU8XTX	Prob.**	0.127	0.708	0.017	0.729	0.000	0.000	0.000	0.001
	Statistic	-2.584**	1.012	1.035	22.761	-2.430**	-2.215**	-1.430**	45.754**
LREU8MTM	Prob.**	0.005	0.844	0.850	0.745	0.008	0.013	0.008	0.019
	Statistic	-4.116**	-0.411	-1.912	31.336	-8.935**	-3.876**	-3.308**	74.480**
LREU8TRADE	Prob.**	0.000	0.341	0.028	0.302	0.000	0.000	0.000	0.000

Note: LLC, Breitung IPS, ADF-Fisher tests examine the null hypothesis of non-stationarity, and ** indicates statistical significance at the 5% level. The lag length is selected using the modified Schwarz Information Criteria.

Appendix III. Cointegration Test Results

Table III.2.(a). Pedroni and Kao Panel co-integration test results-Trade Openness Variables

Variables		Pedroni Residual Cointegration Tests							Kao Cointegration Test
		Panel v-Statistic	Panel rho-Statistic	Panel PP-Statistic	Panel ADF-Statistic	Group rho-Statistic	Group PP-Statistic	Group ADF-Statistic	ADF-Statistic
LRGDP & LREU27EXP	Test statistic	-1.797	-4.398**	-6.157**	-3.315**	-0.333	-5.441**	-4.305**	-1.206
	P-Value**	0.964	0.000	0.000	0.001	0.370	0.000	0.000	0.114
LRGDP & LREU27IMP	Test statistic	-1.106	-1.833**	-2.460**	-3.254**	0.205	-2.951**	-3.523**	-1.572
	P-Value**	0.866	0.033	0.007	0.001	0.581	0.002	0.000	0.058
LRGDP & LREU27XMG	Test statistic	-2.825	-5.784**	-6.817**	-7.075**	-0.607	-4.710**	-5.067**	-0.690
	P-Value**	0.998	0.000	0.000	0.000	0.272	0.000	0.000	0.245
LRGDP & LREU12EXP	Test statistic	-2.005	-4.209**	-5.896**	-5.090**	0.061	-4.114**	-3.369**	-0.557
	P-Value**	0.978	0.000	0.000	0.000	0.524	0.000	0.000	0.289
LRGDP & LREU12IMP	Test statistic	-1.166	-1.798**	-2.508**	-3.273**	-0.195	-3.712**	-4.348**	-1.536
	P-Value**	0.878	0.036	0.006	0.001	0.423	0.000	0.000	0.062
LRGDP & LREU12XMG	Test statistic	-2.818	-5.604**	-6.796**	-6.917**	0.161	-3.727**	-4.331**	0.046
	P-Value**	0.998	0.000	0.000	0.000	0.564	0.000	0.000	0.482
LRGDP & LREU7EXP	Test statistic	-2.259	-3.071**	-4.008**	-4.639**	0.034	-5.058**	-5.229**	-2.492**
	P-Value**	0.988	0.001	0.000	0.000	0.514	0.000	0.000	0.006
LRGDP & LREU7IMP	Test statistic	-1.978	-0.923	-1.982**	-2.270**	0.762	-1.889**	-2.329**	-2.356**
	P-Value**	0.976	0.178	0.024	0.012	0.777	0.030	0.010	0.009
LRGDP & LREU7XMG	Test statistic	-2.784	-2.523**	-4.430**	-4.256**	0.068	-4.423**	-3.602**	-1.165
	P-Value**	0.997	0.006	0.000	0.000	0.527	0.000	0.000	0.122
LRGDP & LREU8EXP	Test statistic	-2.675	-1.547	-2.357**	-2.360**	1.443	-3.273**	-2.137**	-1.612
	P-Value**	0.996	0.061	0.009	0.009	0.926	0.001	0.016	0.053
LRGDP & LREU8IMP	Test statistic	-2.245	-1.667**	-2.807**	-2.948**	1.163	-2.775**	-3.349**	-2.163
	P-Value**	0.988	0.048	0.003	0.002	0.878	0.003	0.000	0.015
LRGDP & LREU8XMG	Test statistic	-2.802	-1.137**	-1.855**	-2.152**	1.018	-2.498**	-2.221**	-1.223
	P-Value**	0.998	0.128	0.032	0.016	0.846	0.006	0.013	0.111

Note: Pedroni's (2004) test: the null hypothesis is that the variables are not cointegrated, under the null tests, all variables are distributed normal (0,1); Kao's (1999) tests: the null hypothesis is that the variables are not cointegrated; ** indicates statistical significance at the 5% level (rejection of the null hypothesis of no-cointegration)

Table III.2.(b). Pedroni and Kao Panel co-integration test results-Trade Integration Variables

Variables		Pedroni Residual Cointegration Tests							Kao Cointegration Test
		Panel v-Statistic	Panel rho-Statistic	Panel PP-Statistic	Panel ADF-Statistic	Group rho-Statistic	Group PP-Statistic	Group ADF-Statistic	ADF-Statistic
LRGDP & LREU27XTX	Test statistic	-2.832	-3.355**	-4.353**	-4.464**	0.127	-3.719**	-3.803**	-0.602
	P-Value**	0.998	0.000	0.000	0.000	0.551	0.000	0.000	0.274
LRGDP & LREU27MTM	Test statistic	-2.825	-0.897	-1.470	-2.105**	1.778	-1.393	-2.377**	-0.682
	P-Value**	0.998	0.185	0.071	0.018	0.962	0.082	0.009	0.248
LRGDP & LREU27TRADE	Test statistic	-2.827	-4.617**	-5.547**	-3.265**	0.856	-2.379**	-1.991**	0.222
	P-Value**	0.998	0.000	0.000	0.001	0.804	0.009	0.023	0.412
LRGDP & LREU12XTX	Test statistic	-2.832	-3.355**	-4.353**	-4.464**	0.127	-3.719**	-3.803**	-0.602
	P-Value**	0.998	0.000	0.000	0.000	0.551	0.000	0.000	0.274
LRGDP & LREU12MTM	Test statistic	-2.821	-1.319	-1.864**	-2.162**	0.961	-1.836**	-2.176**	-0.591
	P-Value**	0.998	0.094	0.031	0.015	0.832	0.033	0.015	0.277
LRGDP & LREU12TRADE	Test statistic	-2.826	-4.540**	-5.527**	-5.524**	0.684	-2.505**	-2.306**	-0.197
	P-Value**	0.998	0.000	0.000	0.000	0.753	0.006	0.011	0.422
LRGDP & LREU7XTX	Test statistic	-2.817	-3.669**	-3.667**	-3.001**	-0.977	-4.839**	-3.798**	-0.439
	P-Value**	0.998	0.000	0.000	0.001	0.164	0.000	0.000	0.330
LRGDP & LREU7MTM	Test statistic	-2.812	-2.210**	-2.331**	-2.692**	0.773	-1.722**	-1.488**	-0.535
	P-Value**	0.998	0.014	0.010	0.004	0.780	0.043	0.068	0.296
LRGDP & LREU7TRADE	Test statistic	-2.785	-2.483**	-3.559**	-4.215**	0.504	-3.709**	-3.612**	-0.980
	P-Value**	0.997	0.007	0.000	0.000	0.693	0.000	0.000	0.164
LRGDP & LREU8XTX	Test statistic	-2.832	-1.626**	-2.018**	-1.967**	1.188	-1.209**	-1.492**	-0.756
	P-Value**	0.998	0.052	0.022	0.025	0.883	0.113	0.068	0.225
LRGDP & LREU8MTM	Test statistic	-2.812	-2.072**	-2.536**	-2.535**	0.732	-2.463**	-2.931**	-1.319
	P-Value**	0.998	0.019	0.006	0.006	0.768	0.007	0.002	0.094
LRGDP & LREU8TRADE	Test statistic	-2.801	-1.245**	-1.910**	-1.989**	1.208	-4.459**	-3.259**	-1.159
	P-Value**	0.998	0.107	0.028	0.023	0.887	0.000	0.001	0.123

Note: Pedroni's (2004) test: the null hypothesis is that the variables are not cointegrated, under the null tests, all variables are distributed normal (0,1); Kao's (1999) tests: the null hypothesis is that the variables are not cointegrated; ** indicates statistical significance at the 5% level.