Trade And Output Convergence In The New Members Of The European Union*

Andrea Ingianni†

August, 2008

The impact of trade on output convergence and economic integration is a highly debated topic with no clear empirical answer. In the paper we start from Ben-David (1993) and we follow Rodriguez (2007) 's footsteps to "test-drive" their major conclusions on the fifth round of the European Enlargement. Using EU8 (ee, lt, lv, hu pl si, sk, cz) data we find that most of the original results can not be easily replicated. We propose a stochastic variant based on the concepts of cointegration and causality, which can help shedding some light in presence of short time samples, limited specification potential and trade liberalization policies modelled as smooth transitions. Preliminary evidence fails to confirm the predominant role of trade integration in output convergence suggested by previous research.

Keywords: Trade openness, Growth Convergence, Time series.
JEL Classification: F15, O19, C22

*Preliminary version: please do not quote.

†School of Economics, Holmwood House, Kingston University, Penhryn Road, Kingston-Upon-Thames, Surrey, KT1 2EE . Tel. +44 (0) 20 8417 ext. (6) 2948. Email: a.ingianni@kingston.ac.uk

1 Introduction

A natural question in the mind of the researcher measuring the degree of output convergence associated to the fifth EU enlargement, is whether this is a positive effect of the integration process. The answer as such is rather difficult to find, especially if thought in terms of neoclassical (Solow-Swan) or endogenous (Arrow-Romer) growth theories only. In this paper, we try to restrict the analysis to the case of a process of integration characterized by a substantial degree of trade liberalization.

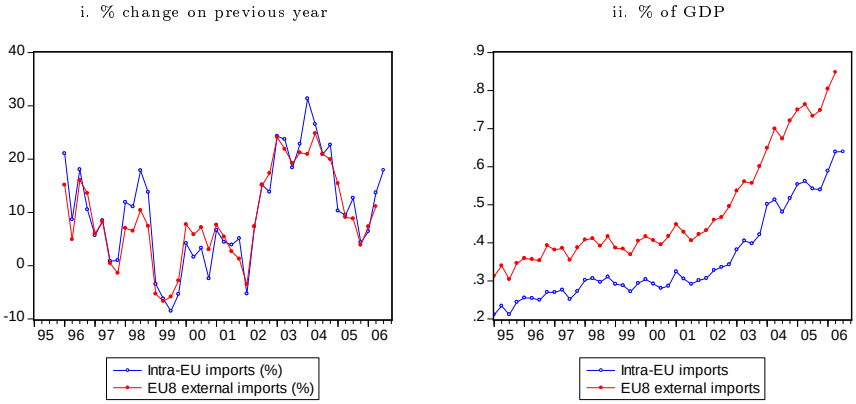
Recently, the tendency seems towards a theoretical endorsement of the importance of international trade in output convergence and economic integration (e.g Rivera-Batiz and Romer (1991), Ben-David and Loewy (2003)) but a scarce support from the empirical literature. Whether the theoretical argument is stronger, an empirical proof is difficult to obtain. The hypothesis is usually tested under a variety of different points of view and methodologies: lately Dollar (1992), Sachs and Warner (1995), Edwards (1992) focused on the research of an optimal indicator of trade openness positively related with growth, whilst Ben-David (1993) reaches a similar conclusion looking at the state of convergence before and after liberalization. On the other hand, there is also a significant branch of the literature dedicated to prove the opposite. All the four mentioned papers were strongly challenged by Rodriguez and Rodrik (1999) on the main consideration that "measures of trade barriers are often correlated with other growth-inhibiting factors" and “trade policy indicators that have been used in the empirical literature are not particularly good” Dollar and Kraay (2004). In a recent paper Rodriguez (2007) also considers the feedback[1] on his original critique and the contributions of Wacziarg and Welch (2003) , Warner (2003) and Dollar and Kraay (2004). In all cases he maintains the view that the new evidence still does “not alter the conclusion that standard measures of trade policies are basically uncorrelated with growth”.

Among all these options, we concentrate on the Ben-David (1993) approach, we consider the Rodriguez and Rodrik (1999) and Rodriguez (2007) critique and we attempt a reinterpretation of his original framework.

In particular, Ben-David (1993) uses as theoretical background the factor prices equalization theorem (FPE) by Samuelson (1964) and Helpman and Krugman (1985). He also refers to the neoclassical growth theory as a source of explanation for convergence, when trade has no impact on reducing income disparities among countries. In a later paper Ben-David and Loewy (2003) augment the Solow approach to take into account the

[1] See for example Jones (2001).

Table 1: Ratio of EU8 imports to GDP



Source: IMF International Finance Statistics and Directions of Trade (2007)

impact of international trade, developing de facto an endogenous growth alternative. We believe the second attempt has greater relevance in the particular context. The 1993 approach however is mainly empirical. It focuses on testing the state of convergence in a liberalization and pre-liberalization stage based on EU data from 1950 to 1985. Quite differently from that period, the process of trade liberalization followed by the new members of the EU in the last 10 years was rather smooth. Moreover, it was subject to specific accession agreements, discussed on individual basis in every country. At different stages, this process lead to the adoption of the regime embraced by the old EU members during the 90s, starting from the Treaties of Rome in 1957. In this context it is obviously challenging to identify a unique divide between liberalization and non-liberalization.

2 The dynamics of trade

Since part of the existing research confirm some degree of growth convergence between old and new members, the fifth round of EU enlargement offers an opportunity to test the impact of trade liberalizations over income. It can also give some indications of whether the process of integration between the EU and a group of eastern European economies, stimulated convergence in these countries.

Similarly to Figure III in Ben-David and Loewy (2003), the impact of liberalization on trade is seen graphically inspecting the share of imports from inside EU and the rest of the world over GDP.

Apparently the dynamics of the two series are not extremely different among them-

selves, with a constant difference related to the different volumes of imports from the two regions. A turning point however is easily identifiable around 2002. Considering the full membership to EU of this economies started in May 2004, it anticipates the political integration. This behavior does not appear entirely surprising, considering that trade in the majority of sectors was already liberalized at that date for all EU8. We note this preliminary evidence as a sign that integration has produced a beneficial effect on trade and we move one step forward looking at its influence on output in the area.

3 Methodology

3.1 A re-interpretation of Ben-David (1993)

The choice of Ben-David (1993) was to use sigma-convergence to measure income dispersion during the initial pre and post trade liberalization of the EU. However, the time-series literature has developed an alternative formulation of convergence introduced by Bernard and Durlauf (1995). The aim of this section is to try joining the two contributions, adding additional elements to Rodriguez and Rodrik (1999). The original Ben-David (1993) argument can be re-interpreted as following:

- The central argument of Ben-David is that according to some theory (Balassa (1964) and Samuelson (1964) TFP), if the degree of trade liberalization increases then convergence should occur. Therefore when convergence is confirmed among a set of country, if we can exclude other factors its determinant is free trade. In time series terms, it makes sense to test the direction of the causal relation between GDP per capita and the degree of liberalization (i.e. openness, see section 3.3).

- Ben-David (1993) uses the dispersion of relative income as a measure for convergence (sigma-convergence). The link between relative incomes can be explored more generally in terms of its long-run dynamics using the concepts of stationarity and cointegration.

- If the process of liberalization is spread in time and it is difficult to clearly identify a pre and post liberalization stage, it can be sufficient to observe that the degree of trade liberalization and the output are moving in the same direction (i.e. sharing a long-run / cointegrating relation) and that the direction of causality between the two variables goes from the first to the second.

We refer to the last concept as "smooth" trade liberalization. In the next sections we try to apply this approach to the EU enlargement.

3.2 An application to the EU enlargement

Some research on the state of convergence in the new member states during the last decade already exists. If this period is seen as subdivided in pre and post liberalization, then the results of these studies can be interpreted in the Ben-David (1993) view as positive or negative evidence of the impact of trade on convergence. Ingianni and Zdarek (2008) for example, apply sigma and time-series based tests of convergence to eight EU economies in the period 1995-2006 . They further subdivided the sample in two parts 1995-2002 and 2002-2006 and find positive evidence of sigma-convergence, which could be potentially explained by the degree of trade liberalization between EU15 and EU8. The use of integration and cointegration techniques however, brings mixed evidence with some countries exhibiting some degree of convergence but generally associated with small statistical significance. Strictly following sigma-convergence would lead to support the predominant role of trade liberalization over convergence[2].

Another important consideration of Ben-David (1993) is the idea of deducing the impact of trade observing the degree of convergence "when all its other determinants can be excluded". This last intuition is tested empirically in the paper and it is very dependent on the specific framework he was referring to. However, using the concept of causality allows a more generic formulation which also captures the effects of other factors potentially involved in the determination of convergence. Clearly some considerations cannot be applied to the enlargement case. At least four critical points must be considered:

1. Convergence was a new trend after the liberalization (post world-war in the specific case).

2. Countries choosing not to join a free-trade agreement did not experience the same levels of convergence.

3. Other not integrated economies did not experience the same levels of convergence.

4. The contribution of other factors to EU convergence is not as relevant as trade liberalization.

The first three were explicitly criticized by Rodriguez and Rodrik (1999), we are going to analyse their relevance for the EU enlargement.

The general consideration is that, since it is difficult to identify a pre and after liberalization period in the last decade for the new members, it is also difficult to test condition

[2]When 2002 is seen as the turning point between liberalization and non-liberalization.

(1) exactly in the same way as Ben-David (1993). An alternative could be expanding the period of time under investigation (e.g. pre 90s) although empirically it represents a big challenge[3]. The Rodriguez critique focus on the identification of a long run trend in convergence in the pre liberalization era. It is argued that the choice of countries in the original empirical exercise bias its final results. Clearly, the context is very specific and it is likely that the critique does not apply in other situations. We note that, in the light of existing literature on convergence, it also makes sense to try a different approach to the identification of the trend. An often used alternative, which we are going to use in 3.3 for the reasons explained in 3.2, is cointegration. This choice however carries a modified definition of output convergence as explained in section 3.1.

Regarding point (2) Rodriguez and Rodrik (1999) argue that the state of convergence is calculated in Ben-David (1993) using the group of non-liberalizing instead of the liberalizing countries as a benchmark. The impression here is that the concept of convergence is seen in its "neoclassical" definition. Taking into account the Bernard and Durlauf (1995) view, should make it easier to correct the analysis in the Rodriguez sense. The alternative solution proposed by Rodriguez and Rodrik (1999) was a simple correction of the sigma statistic. For the EU enlargement case, comparing with other countries would probably mean relying on Eastern economies which did not benefit of free trade agreements in the period 1995 - 2006. Because of the peculiar mechanism of accession, this group excludes economies at different stages of negotiation which can have already lowered tariffs in specific sectors , making the empirically exercise quite challenging.

Point (3) is criticised by Rodriguez on empirical bases, mainly on the consideration that there is "asymmetry in [the] selection of diverging and converging areas". Convergence and divergence is seen as function of geographical distance and the original conclusion is reverted when looking at East Asian and Latin American countries. As usual, we note that convergence can be measured using a different methodology. Moreover, trying to prove (3) in our context would mean extending the Ben-David analysis to period 1995 2006 with potential empirical difficulties.

Point (4) is one of the strongest assumptions of Ben-David and must be considered carefully. In particular, in the case of the EU enlargement there might be other factors which were not fully relevant for the old members of EU (FDI, migration, labour mobility, reallocation of production units, etc... - see for example Pop-Silaghi (2007).

[3]For example under the perspective of data availability, reliability and disaggregation for accession countries.

3.3 Empirical results

An interesting exercise, which is not explicitly considered in the reference literature presented above, consists in testing the relation between trade and output using causality tests. This is a frequent choice in the time series literature and we believe it can help adding some elements to the debate. As in the case of regressions-based exercises, the choice of a meaningful indicator for trade liberalization is the central issue. Among the existing alternatives we note that the case of EU8 countries offers little choice. Dollar (1992) real exchange rates distortion and variability indexes should be avoided because the heterogeneous transition towards fixed exchange rates (ERMII) of the countries under investigation. The Sachs and Warner (1995) or modified Wacziarg and Welch (2003) dummy can be calculated only assuming a reliable measure of all its components[4] is readily available for all new member states. Similar difficulties arise for all the nine openness indicators surveyed by Edwards (1998).

The most convenient choice appeared to use an indicator similar to Romer (1999) and relate per capita income with trade share (to EU) in the eight new members. Note that this paper has been criticized by Rodriguez based on considerations similar to what we reported in section 3.2 point (3). However, the methodology we are using is quite different and unaffected by geographical components. In particular, we calculate the degree of openness as ratio of import exports over GDP for every country and we test for Johansen (1991) cointegration and Granger (1969) causality. Results are reported in Table 2. A unique linear relation between the two variables is interpreted as both sharing the same dynamics. Causality is then used to test whether these are driven by the first or the second variable. This approach gives insights on the relationship between openness and output but is unable to explore the link with convergence. To overcome this problem, we also test the existence of a long-run relation between individual EU8's GDP per capita and the GDP per capita in the 15 old members aggregate (EU15). If this relation exists in all countries and it is unique, then we are assuming they are converging in the Bernard and Durlauf (1995) sense[5]. These new results are shown in table 3. Figure 5 and 4 in the Appendix show the quarterly growth rate around the EU15 aggregate and the variation in output differentials between 1995 and 2007.

[4] Average tariff rates, non tariff barriers as % of imports, socialist economic system, state monopoly of exports, black market premium during the 70s and 80s.

[5] Note that according to this approach output differences are seen as a transitory phenomenon (the countries grow together in the long-run, except for minor variations). In the neoclassical tradition, output differences tend to decline in time for convergence to exist (catching-up - i.e. poor countries grow faster). The latter hypothesis is usually tested using "beta" regressions and has, among others, the disadvantage of mixing up short-run transitional dynamics and long-run steady-state behaviour.

Table 2: Long-run dynamics: multicountry openness and GDP.

	LT°	**LV°**	**EE°**	**CZ°**
None	23.17722	23.87522	13.48084	18.08383
At most 1	0.002391	0.681248	0.155566	0.107913
Reject: H0 None	1%	1%	5%	1%
Reject: H0 AT1	N.R.	N.R.	N.R.	N.R.
Coint. Rels.	1	1	1	1
	SK	**PL°**	**SI**	**HU**
None	10.81877	14.30869	12.76467	7.328329
At most 1	0.020087	0.720219	4.223345	2.930365
Reject: H0 None	N.R.	5%	5%	N.R.
Reject: H0 AT1	N.R.	N.R.	5%	N.R.
Coint. Rels.	unknown	1	>1	unknown

Note: N.R. not rejected. 1% critical values: 16.31 (none), 6.51 (AT1).

Table 3: Stochastic convergence: output differentials with EU15.

	LT	**LV°**	**EE°**	**CZ°**
None	36.30821	27.71801	36.32323	16.47171
At most 1	5.588638	3.825346	3.803221	0.750101
Reject: H0 None	1%	1%	1%	1%
Reject: H0 AT1	5.00%	N.R.	N.R.	N.R.
Coint. Rels.	>1	1	1	1
	SK°	**PL**	**SI**	**HU**
None	23.83750	7.134780	20.45711	7.949469
At most 1	0.109044	0.081142	4.217939	1.107816
Reject: H0 None	1%	N.R.	1%	N.R.
Reject: H0 AT1	N.R.	N.R.	5%	N.R.
Coint. Rels.	1	unknown	>1	unknown

Note: N.R. not rejected. 1% critical values: 16.31 (none), 6.51 (AT1).

The concept of causality is used estimating the following models:

$$y_t = \alpha_0 + \sum_{i=1}^{L} \alpha_i y_{t-i} + \sum_{i=1}^{L} \beta_i x_{t-i} + \varepsilon_t \tag{1}$$

$$x_t = \gamma_0 + \sum_{i=1}^{L} \gamma_i x_{t-i} + \sum_{i=1}^{L} \delta_i y_{t-i} + \mu_t \tag{2}$$

with L: maximum number of lags (e.g. AIC or SIC).
The null hypothesis are set to:

$$H_0 : \beta_1 = \beta_2 = ... = \beta_L$$

for (1) and:

$$H_0 : \gamma_1 = \gamma_2 = ... = \gamma_L$$

for (2). In both cases the Granger (1969) procedure involves estimating the residuals $\hat{e_t}$ and $\hat{u}_t$ of the restricted models:

$$y_t = \alpha_0 + \sum_{i=1}^{L} \alpha_i y_{t-i} + e_t$$

$$x_t = \gamma_0 + \sum_{i=1}^{L} \gamma_i x_{t-i} + u_t$$

and finally deriving the Wald F-statistics :

$$S_1 = \frac{(\sum_{t=1}^{T} \hat{e}_t - \sum_{t=1}^{T} \hat{\varepsilon}_t)(T - 2L - 1)}{L(\sum_{t=1}^{T} \hat{\varepsilon}_t)} \sim F_{L,T-2L-1}$$

$$S_2 = \frac{(\sum_{t=1}^{T} \hat{u}_t - \sum_{t=1}^{T} \hat{\mu}_t)(T - 2L - 1)}{L(\sum_{t=1}^{T} \hat{\mu}_t)} \sim F_{L,T-2L-1}$$

Alternative methods for testing causality include, simple AR systems, instantaneous systems and linear feedback as in Geweke (1982). The latter allows to decompose the linear dependence between x and y into three forms of linear feedback: from x to y,

from y to x, and "instantaneously" between x and y. The advantage is not only the ability of identifying a causal relation between the two variables but also the degree of feedback (strength of relation) between them. A detailed survey based on this approach is available in Granger (2001). Further investigation in this sense would certainly be beneficial to explore the magnitude of causality and we note it as a potential area for future research.

Recently Hurlin (2008) proposed a test for Granger non-causality in heterogeneous panels. The models presented above are modified as follows. For example, extend (1) to a group of countries $n = 1, 2...., N$ at time $t = 1, 2, ..., T$:

$$y_{n,t} = \alpha_{n,0} + \sum_{i=1}^{L} \alpha_n^{(i)} y_{n,t-i} + \sum_{i=1}^{L} \beta_n^{(i)} x_{n,t-i} + \varepsilon_{n,t}$$

where $\beta_n = [\beta_n^{(1)}, ..., \beta_n^{(L)}]'$ and suppose the individual effects $\alpha_{n,0}$ are fixed for simplicity. The author tests the null hypothesis of homogeneous non-causality (HNC) against the alternative of causality still allowing for potential non-causality for some (not all) units. Formally:

$$\begin{aligned} H_0 : &\quad \beta_i = 0\,,\ \forall i = 1, 2, ..., N \\ H_1 : &\quad \begin{cases} \beta_i = 0 & \forall i = 1, 2, ..., N_1 \\ \beta_i \neq 0 & \forall i = N_1 + 1, N_2 + 2, ..., N \end{cases} \end{aligned}$$

where N_1 unknown but $0 < \frac{N_1}{N} < 1$. Note that when $N_1 = N$, H_1 is in fact H_0 and there is no-causality for all the members of the panel (HNC). If $N_1 = 0$ there is causality for all members of the panel (HC). The test statistic is calculated averaging the individual Wald statistics for every country:

$$S_{N,T}^{Hnc} = \frac{1}{N} \sum_{n=1}^{N} S_{1,n}$$

following a similar methodology used in panel unit-roots tests by e.g. Im et al. (2003) or Pesaran (2005). Critical values (5%) are either stochastically simulated from 50.000 replications or approximated from a standardized $\widetilde{Z}_N^{Hnc}$ statistic[6]. Monte-carlo simulations show the test has good power in finite samples ($T = 10, 25, 50$).

Based on datasets from the IMF Directions of Trade Statistics, Eurostat New Chronons

[6]See Hurlin (2008) for further details.

Table 4: Granger causality (Trade openness and GDP)

	CZ°	**EE**	**HU°**	**PL°**
GDPK$\not\Rightarrow$OPN	0.27746	0.62524	0.59288	0.18068
OPN$\not\Rightarrow$GDPK	0.01023*	0.84716	8.0E-07*	0.00343*
	LV°	**LT°°**	**SK°**	**SI°**
GDPK$\not\Rightarrow$OPN	0.35768	0.00188*	0.41273	0.69810
OPN$\not\Rightarrow$GDPK	0.02306*	0.59577	0.02116*	0.00233*

GDP chain-linked vol.s (2000), per capita, seasonally adj. (°) OPN to GDP. (°°) GDP to OPN. (*) Rejection at 5%. T=51

and UN Population Division, we obtain the results in Table 4 and 5. Series were deseasonalised before testing.

Only for CZ, HU, PL, LV, SK, SI we reject the null of openness not causing GDP per capita. In all these countries, trade is contributing to growth and not the opposite. Note also that calculating the average $S_{N,T}^{Hnc}$ is straightforward in this context. Results are provided in Table (8) in the Appendix and show that within the EU8 group there is no overall or individual causality from GDP to EXP/IMP. However there is some causality (potentially paired with some non-causality in individual countries) from IMP and possibly EXP to GDP. Decreasing the number of lags on the other hand, reduces the support to the export/import lead growth hypothesis and allow some causality in both directions (rejection of the H_0 in all cases). The relation between OPN and GDP is even more difficult to interpret. Whilst it seems quite clear that a causal relation between OPN and GDP exists in some countries it is not easy to exclude that it also operates in the opposite direction (GDP to OPN).

The existence of simultaneous causality between components of trade and output is usually observed with interest in the literature. For example Weber (2007) underlines how a bivariate cointegration between GDP and imports can be theoretically seen as dependent by a condition of price inelasticity in the import function and stationarity in real exchange rates under PPP. Table 5 illustrates for the EU enlargement.

The case of "inverse" causality (e.g. OPN$\not\Rightarrow$GDP but GDP$\Rightarrow$OPN) could be seen as an indication of a small contribution of trade to growth. If openness does not cause growth but the opposite is tested true, we can imagine the stimulus is generated mainly by other beneficial consequences of the integration process (FDI, migrations, spillovers, etc...) and then transmitted to trade (e.g. raising import volumes: GDP$\Rightarrow$IMP). This seems to be true for Lithuania in the case of openness and Estonia, Slovenia if strictly focusing on imports.

Another approach often used in the literature - in the usual effort of defining a suitable

Table 5: Imports-lead growth.

	CZ°	**EE°°**	**HU**	**LT**
GDP↛IMP	0.40850	0.01491*	0.03178*	0.05136
IMP↛GDP	0.00811*	0.93046	0.05815	0.00807
Lags (L):	1	1	1	5
	LV°	**PL**	**SK°**	**SI°°**
GDP↛IMP	0.77825	0.02071*	0.20299	0.00168*
IMP↛GDP	0.01942*	0.02695*	0.02491*	0.71306
Lags (L):	1	1	1	1

Notes: GDP at market prices, seasonal adjusted. (*) Indicates rejection at 5%. (°) IMP to GDP (°°) GDP to IMP. T = 51.

Table 6: Export-lead growth

	CZ°	**EE°°**	**HU°**	**LT°°**
GDP↛EXP	0.43591	0.00898*	0.21206	0.03260*
EXP↛GDP	0.04654*	0.24812	0.01070*	0.17315
Lags (L):	1	1	1	1
	LV°°	**PL°**	**SK°**	**SI**
GDP↛EXP	1.0E-06*	0.67098	0.42147	0.35212
EXP↛GDP	0.31546	0.00271*	0.02847*	0.31590
Lags (L):	1	1	1	1

GDP at market prices, seasonally adjusted. (°) EXP to GDP. (°°) GDP to EXP. (*) Rejection at 5%. T=51.

indicator for trade liberalization - is trying to isolate the contribution of export to growth (export-led growth, ELG). A survey of the literature, with specific reference to causality, is available in Giles and Williams (2000).

The empirical evidence is quite mixed and does not give a general indication on the role of trade over convergence. The overall picture is better understood from the panel exercise presented above, however individual country contributions can be disaggregated easily from Table (6).

4 Conclusions

The empirical results obtained in the previous section are summarized in Table 7. Cointegration has been used to establish a long run relation between individual GDP per capita and individual openness. When GDP per capita in a set of country shared a long run relation with the aggregated EU15 GDP, we concluded for output convergence in these countries - i.e. they all converge to a common path. Part of the Baltic states (LT, LV) and the ex Czechoslovakia (CZ, SK) show such relation. To make sure output was stimulated by trade we tested for Granger (1969) causality finding the expected direction

Table 7: Empirical summary: single countries.

		EE	**LT**	**LV**	**CZ**
Coint.	i.Openness	Y	Y	Y	Y
	ii. EU15 GDP (*)	-	Y	Y	Y
Causality:	i. Openness	-	-	Y	Y
	ii. Imports	-	-	Y	Y
	iii. Export	-	-	-	Y
	Role of trade?	-	-	Y	Y
		SK	**HU**	**PL**	**SI**
Coint.	i.Openness	-	-	Y	-
	ii. EU15 GDP (*)	Y	-	-	-
Causality:	i. Openness	Y	Y	Y	Y
	ii. Imports	Y	-	-	-
	iii. Export	Y	-	Y	-
	Role of trade?	Y-	-	-	-

(*) "Y" indicates a long run relation between EU15 and individual GDP per capita.

for all but EE, LT. Among the countries in which the relation was respected, we found evidence of import /export-lead growth in the ex Czechoslovakia (CZ, SK), Latvia and Poland (LV, PL). Overall, the only countries for which we could confirm co-existence of the desired relations[7] were the ex Czechoslovakia (although statistically weak for SK) and Latvia. In Estonia trade and growth seem related and growth promotes trade (inverse causality). The latter however does not contribute to convergence. In Lithuania trade and convergence appear related but again convergence promotes trade . In Hungary trade does not promote convergence. Finally in Poland and Slovenia trade promotes national growth but not convergence to EU15. Trade may contribute to divergence in Slovenia.

At the aggregated level, we used the Hurlin (2008) panel non-causality test and we found empirical support for some import or export lead growth, only when an appropriate specification had been chosen. The relationship between openness and growth however, still proved rather weak.

Several difficulties make the analysis more challenging than Ben-David (1993), not last the short period of time under investigation. In general the 5th EU enlargement has consistent differences in respect to previous transitions.

We discussed how the empirical Ben-David (1993) approach does not hold perfectly as found by Rodriguez and Rodrik (1999) and the impact of trade over output convergence may not be so substantial, especially in the last decade as noted by Rodriguez (2007).

[7]Trade, growth and convergence are related and trade promotes convergence.

Our results, mix elements of both sides of the debate but hardly reach an intermediate conclusion. Some preliminary evidence in favour of trade openness seems to emerge from the data. This however does not appear strong enough to unconditionally support its potential benefits on convergence, either within the 5th enlargement or in a larger context. Similarly to Rodriguez, we see the necessity of maintaining alive a debate which has accompanied economic research since its beginning. We showed the limits of strictly endorsing the positive role of trade to growth but without the intention of advocating the merits of opposite protectionist strategies (i.e import substitution) .

References

Balassa, B. (1964) The purchasing-power parity doctrine: A reappraisal. *Journal of Political Economy*, **72**, pp. 584–596.

Ben-David, D. (1993) Equalizing exchange: Trade liberalization and income convergence. *The Quarterly Journal of Economics*, **108** (3), pp. 653–679.

Ben-David, D., Loewy, M. B. (2003) Trade and the neoclassical growth model. *Journal of Economic Integration*, **18** (1), pp. 1–16.

Bernard, A. B., Durlauf, S. N. (1995) Convergence in international output. *Journal of Applied Econometrics*, **10** (1), pp. 97 – 108.

Dollar, D. (1992) Outward-oriented developing countries really do grow more rapidly: evidence-from 95 ldcs, 1976 - 85. *Economic Development and Cultural Change*, **40** (3), pp. 523–544.

Dollar, D., Kraay, A. (2004) Trade, growth and poverty. *The Economic Journal*, **114** (493), p. F22.

Edwards, S. (1992) Trade orientation, distortions and growth in developing countries. *Journal of Development Economics*, **39** (1), pp. 31–57.

Edwards, S. (1998) Openness, productivity and growth: What do we really know? *Economic Journal*, **108**, pp. 383–398.

Geweke, J. (1982) Measurement of linear dependence and feedback between time series. *Journal of the American Statistical Association*, **79**, pp. 304–324.

Giles, J. A., Williams, C. L. (2000) Export-led growth: a survey of the empirical literature and some non-causalityresults. part 1. *The Journal of International Trade and Economic Development*, **9** (3), pp. 261–337.

Granger, C. (1969) Investigating causal relations by econometric models and cross - spectral-methods. *Econometrica*, **37**, pp. 424–38.

Granger, C. W. J. (2001) Some recent developments in a concept of causality. In *Essays in econometrics: collected papers of Clive W. J. Granger*, pp. 71 – 83.

Helpman, E., Krugman, P. R. (1985) *Market Structure and Foreign Trade: Increasing Returns, Imperfect Competition, and the International Economy.* MIT Press, Cambridge, MA.

Hurlin, C. (2008) Testing for granger non-causality in heterogeneous panels. Technical report, HAL. Available at: http://ideas.repec.org/p/hal/papers/halshs-00224434 v1.html.

Im, K. S., Pesaran, M. H., Shin, Y. (2003) Testing for unit roots in heterogeneous panels. *Journal of Econometrics*, **115** (1), pp. 53–74.

Ingianni, A., Zdarek, V. (2008) Real convergence in the new member states: myth or reality? *Journal of Economic Integration*. Forthcoming.

Johansen, S. (1991) Estimation and hypothesis testing of cointegration vectors in gaussian vectorautoregressive models. *Econometrica*, **59**, pp. 1551 – 1580.

Jones, C. (2001) Comment. In Bernanke, B., Cambridge, K. R., eds., *NBER Macroeconomics Annual 2000*. MA, National Bureau of Economic Research.

Pop-Silaghi, M. (2007) Trade flows and migration between UK and some CEEC. INTAS-EU Migration Conference.

Rivera-Batiz, L., Romer, P. M. (1991) Economic integration and endogenous growth. *Quarterly Journal of Economics*, **106** (2), pp. 531–555.

Rodriguez, F. (2007) Openness and growth: what have we learned? Working Papers 51, United Nations, Department of Economics and Social Affairs.

Rodriguez, F., Rodrik, D. (1999) Trade policy and economic growth: A skeptic's guide to cross-national evidence. *NBER Working Paper*, (7081).

Romer, J. A. F. D. (1999) Does trade cause growth? *The American Economic Review*, **89** (3), pp. 379–399.

Sachs, J., Warner, A. (1995) Economic reform and the process of global integration. *Brookings Papers on Economic Activity*, **1**, pp. 1–118.

Samuelson, P. A. (1964) Theoretical notes on trade problems. *Review of Economic*, **46**, pp. 145–154.

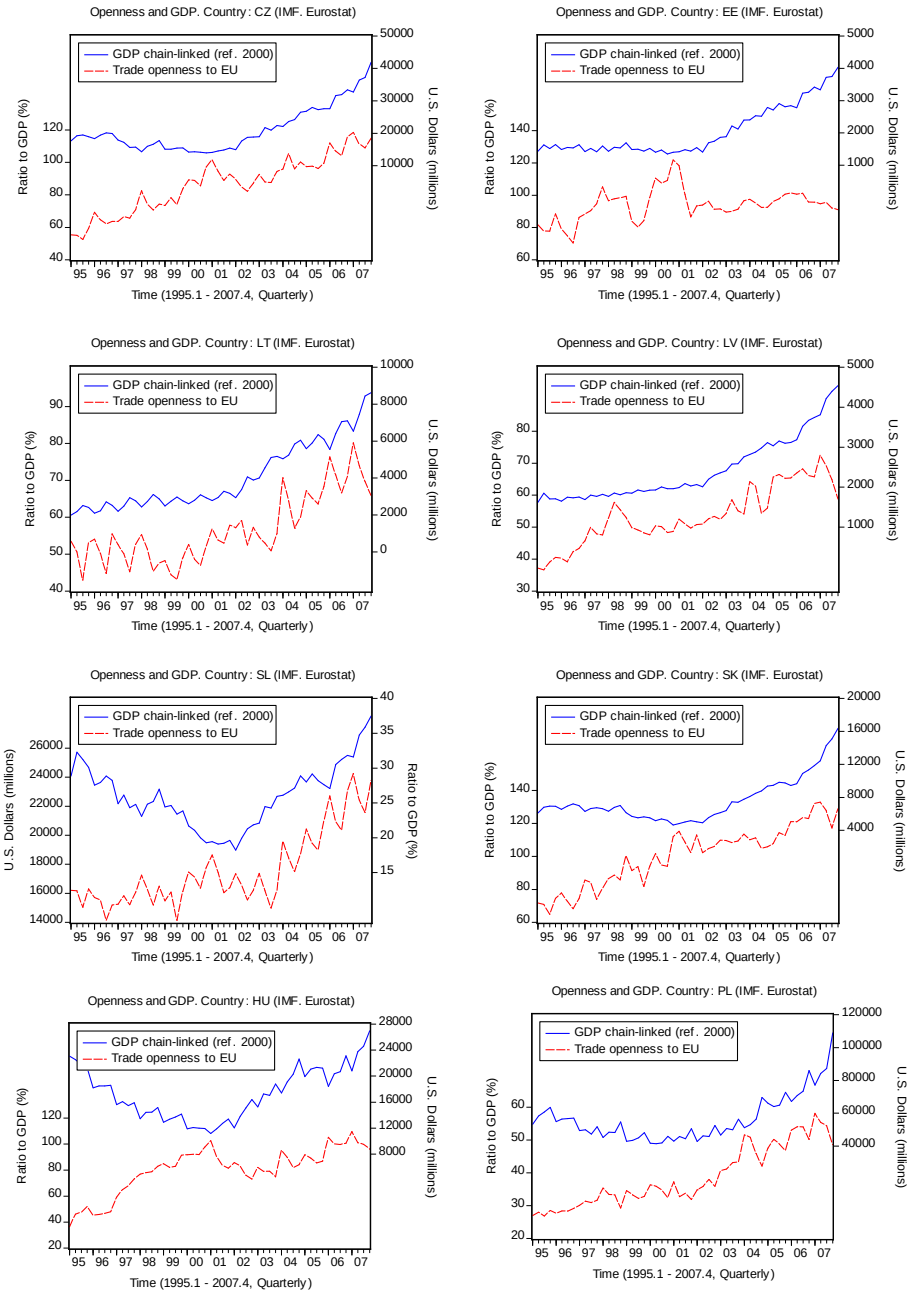
Wacziarg, R., Welch, K. H. (2003) Trade liberalization and growth: New evidence. *NBER Working Papers*, (10152).

Warner, A. (2003) Once more into the breach: economic reform and global integration.

Weber, E. (2007) Simultaneous causality in international trade. *SBF 649 Discussion Paper*, (18).

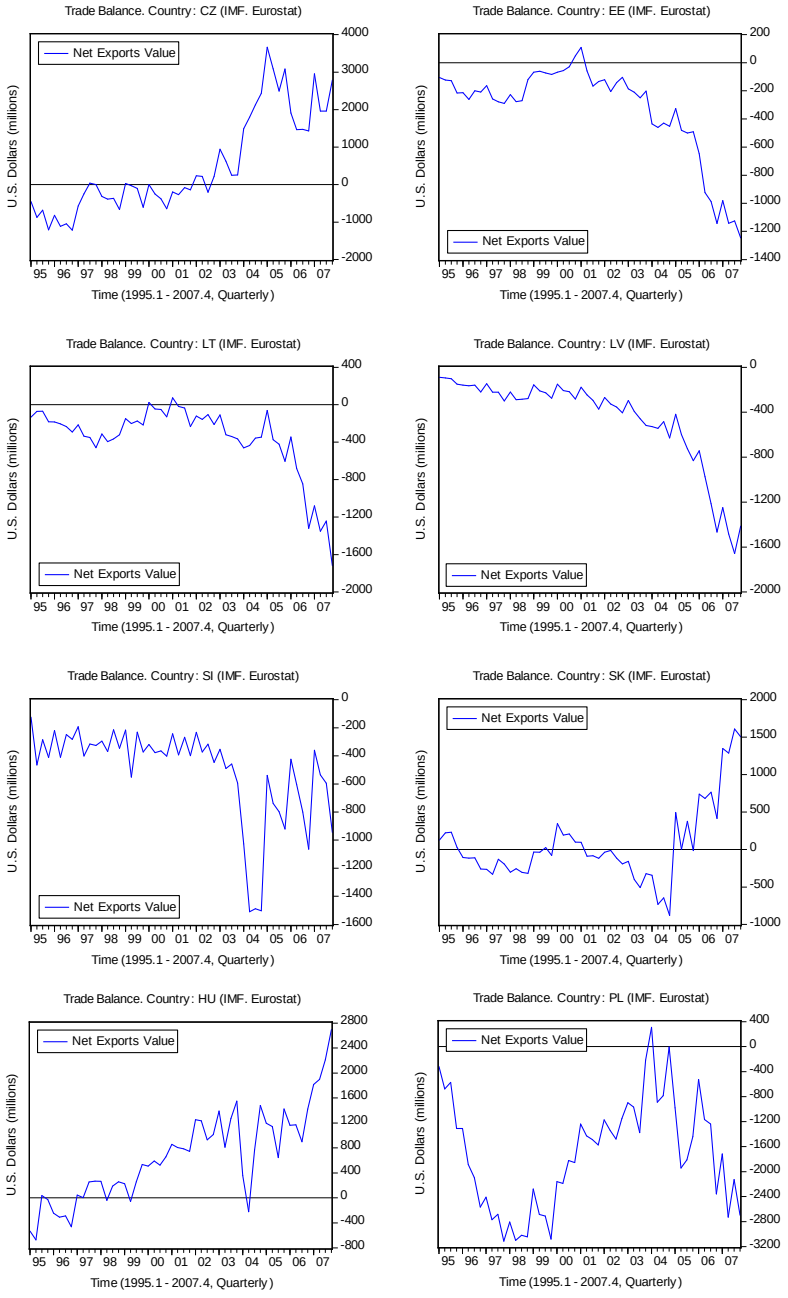
Appendix

Figure 1: Trade Openness and GDP



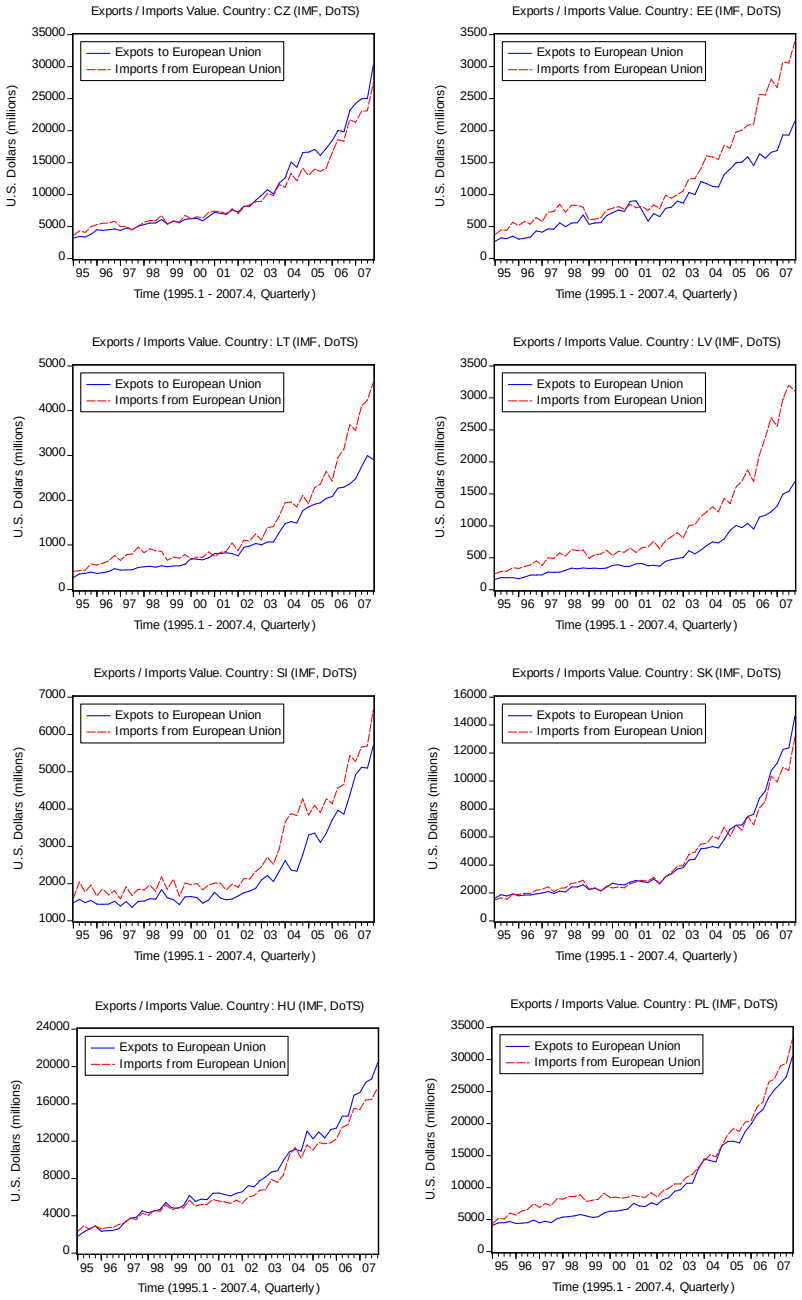
Source: Eurostat New Chronos and IMF Directions of Trade (2007).

Figure 2: Net Exports Value



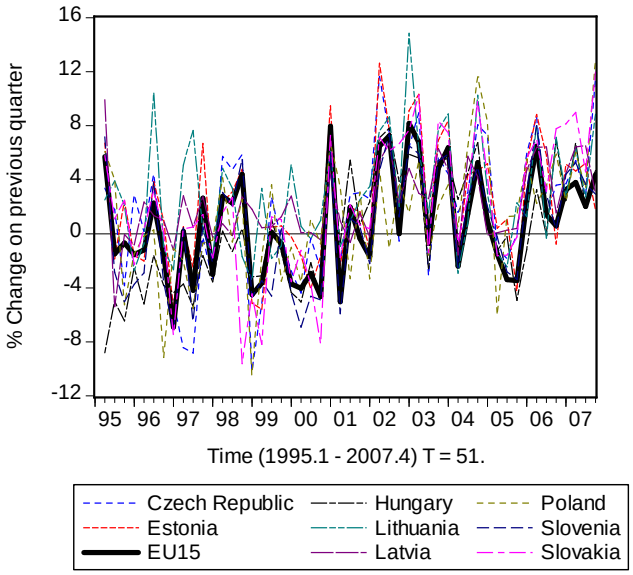
Source: IMF Direction of Trade Statistics, April 2007, Quarterly values, Units: Millions US$, Partner country: EU.

Figure 3: Exports and Imports Value



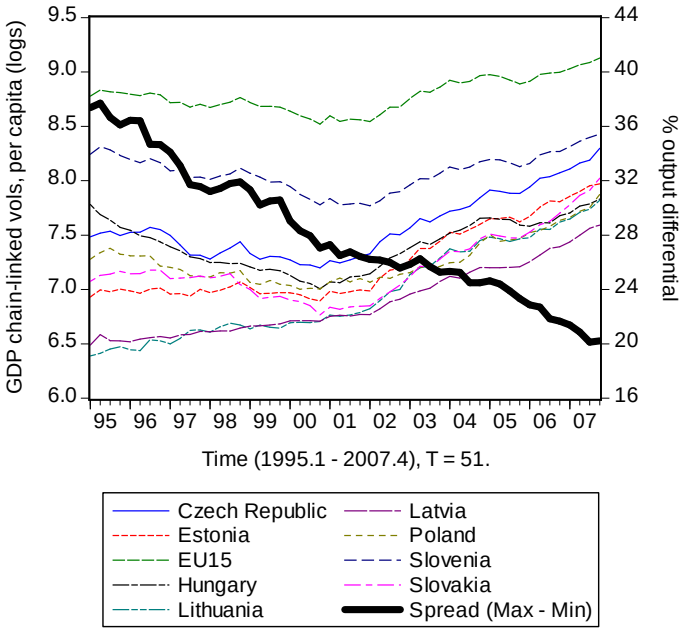
Source: IMF Direction of Trade Statistics, April 2007, Quarterly values, Units: Millions US$, Partner country: EU.

Figure 4: Stochastic convergence: GDP per capita growth rates.



Source: Eurostat, New Chronos 2008.

Figure 5: Convergence by catching-up: Output differentials.



Source: Eurostat, New Chronos 2008.

Table 8: Hulrin (2008) Panel Non-Causality

					S_n									
H_0	L	**CZ**	**EE**	**HU**	**LT**	**LV**	**PL**	**SK**	**SI**	$S_{8;43}^{Hnc}$	$c_{8,43}$	$\tilde{c}_{8,43}$	Judg.	
GDP$\nRightarrow$OPN	3	1.6773	2.1415	1.1356	1.7704	1.4315	3.1672	1.6051	3.1376	2.00827	R	NR	R	*
OPN$\nRightarrow$GDP		1.9781	3.3291	0.7957	0.8306	0.4909	2.8892	5.8008	3.9085	2.50287	R	R	R	***
GDP$\nRightarrow$IMP	3	1.2709	4.2226	1.1704	1.1611	1.1946	0.7062	0.6247	1.6548	1.50066	NR	NR	NR	***
IMP$\nRightarrow$GDP		1.2179	1.5720	1.7213	0.2146	2.1129	2.0869	5.7632	2.9137	2.20032	R	R	R	**
GDP$\nRightarrow$EXP	3	1.8385	2.0402	0.9669	0.5145	0.0624	1.3054	0.3538	2.1896	1.15891	NR	NR	NR	***
EXP$\nRightarrow$GDP		1.2685	3.1373	0.9220	1.0354	1.3037	1.5707	4.2596	2.3884	1.98568	NR	NR	NR	*
GDP$\nRightarrow$OPN	4	1.3594	2.7051	1.3287	2.5010	0.5248	2.0306	3.4729	4.6345	2.31962	R	R	R	***
OPN$\nRightarrow$GDP		3.0879	1.4133	1.3551	1.4624	1.2126	4.0719	3.6684	2.2843	2.31949	R	R	R	***
GDP$\nRightarrow$OPN	1	4.4209	5.5953	4.6129	4.5800	6.3552	1.1914	2.4194	3.7101	4.11065	R	R	R	***
OPN$\nRightarrow$GDP		6.4976	4.7352	2.8512	1.9466	1.1987	3.0358	12.3385	0.9363	4.19251	R	R	R	***
GDP$\nRightarrow$IMP	1	3.4418	6.0207	5.8345	2.1434	7.0037	0.8722	0.8602	3.0329	3.65120	R	R	R	***
IMP$\nRightarrow$GDP		3.6431	3.0068	0.0818	0.7324	5.3289	2.5055	11.6559	1.9992	3.61918	R	R	R	***
GDP$\nRightarrow$EXP	1	13.7452	3.3837	4.3790	4.2664	4.5703	0.0752	2.4929	3.1311	4.50548	R	R	R	***
EXP$\nRightarrow$GDP		2.1702	2.3402	0.1673	0.0051	2.9330	2.0805	6.9271	0.6108	2.15427	R	R	R	***

Notes. The approximated and simulated critical values for $N = 8$ and $T = 43$ are interpolated from Table 4 in Haurlin (2008): $c_{8,43}(0.05) = 2.1350$ and $\tilde{c}_{8,43}(0.05) = 1.9958$. R indicates rejection of the null hypothesis (homogeneous non-causality), NR inability to dismissH_0. A subjective judgment is provided based on interpolated and non-interpolated c.v's (*** very significant). L is the number of lags. S_n and $S_{8,43}^{Hnc}$ are respectively the country and average Wald statistics.