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EUROPE AS AN OPTIMUM CURRENCY AREA: THE EXPERIENCE OF THE BALTIC COUNTRIES*

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1 INTRODUCTORY REMARKS

The theory of Optimum Currency Areas (OCAs) is central to international macroeconomic analysis and to the broad debate on monetary integration and has grown to be of particular interest to the European currency area in recent decades.

The key conclusions of the OCA theory are based on the premise that, for a currency area to be successful and labelled as optimum, the benefits of joining should outweigh the costs that the loss of monetary policy tools entails for prospective members (Van Overtveldt 2011). The literature on this topic lists a number of criteria that need to be met for a monetary union to qualify as an OCA. These criteria form the basis of the OCA theory and serve a twofold purpose: on the one hand, they seek to reduce the incidence of asymmetric shocks by requiring that participating economies share similar structural characteristics (e.g. labour market institutions, inflation rates and levels of economic development); on the other hand, they aim to establish adequate adjustment mechanisms (e.g. labour mobility and fiscal integration), to lessen the impact of asymmetric shocks, should they occur.[1]

The endogeneity of the OCA criteria, a notion developed in the context of discussions on the OCA theory, assumes that monetary integration leads to a significant deepening of reciprocal trade. This has led to the idea that countries may satisfy the OCA criteria ex post, even if they do not ex ante (Frankel and Rose 1998). By arguing that non-qualifying currency areas could, over time, turn into OCAs, the endogeneity hypothesis provided the theoretical underpinning for refuelling the debate on Economic and Monetary Union (EMU). Thus, the OCA criteria could be fulfilled ex post, as a result of the expected higher trade integration and income correlation (Mongelli 2008). On the other hand, endogeneity would mean that the fulfilment of the criteria is the result of a dynamic process, potentially involving factors that hamper, rather than facilitate, the development of an OCA. Thus, even economies that meet the OCA criteria before entering a monetary union may stop doing so after they have joined (see, inter alia, Giannakopoulos and Demopoulos 2011).

In the case of the euro area, although it was generally accepted that the participating countries did not initially satisfy the conditions for an OCA, the monetary union seemed to work well from its inception in 1999 to the outbreak of the financial crisis in 2008. Thereafter, however, developments across the euro area countries brought to light the flaws of this union, as economic convergence among the participating countries proved to have been inadequate, and appropriate mechanisms to absorb asymmetric shocks were not in place. This article aims to empirically test the validity of this narrative. To this end, it will attempt to empiri-

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1 See Gibson, Palivos and Tavlas (2014).

cally confirm the validity of the hypotheses that: (a) the monetary union functioned smoothly, with the participating economies following a path of convergence, thereby supporting the case for endogeneity; and (b) this changed in the period after the outbreak of the crisis. If confirmed, this would certainly support the argument that the initial perception of a smooth path towards a European OCA was overly optimistic.

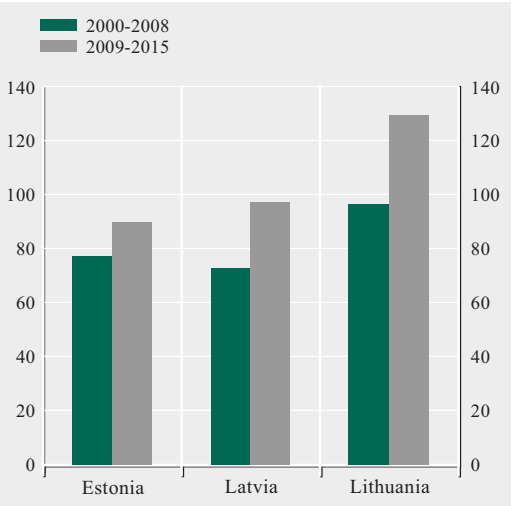
The analysis focuses on the case of the three Baltic economies, i.e. Estonia, Lithuania and Latvia. These countries seceded from the former Soviet Union in the early 1990s and simultaneously embarked on a transition to market economy. Having joined the European Union (EU) in 2004, they all adopted the single currency within a period of five years (2011-2015).[2] Although their euro area entry is relatively recent, their economic integration into the EU began immediately after their independence from the Soviet Union, as all three countries had set EU and euro area membership as a long-term national goal. Attesting to this is the fact that it took them only a short time to achieve a very high degree of economic integration with the rest of the EU. Indeed, as shown in Chart 1, by the start of the past decade, these economies had already had quite high trade openness and, as seen from Chart 2, a high degree of trade integration with the EU countries.

Furthermore, all three countries adopted fixed exchange rates of their currencies vis-à-vis the euro, which meant that their monetary policies had to be closely coordinated with that of the European Central Bank (ECB). Due to the structural similarities of their economies, the three countries can be examined together as a bloc for the purposes of this investigation.

The analysis that follows will address the question of whether the abovementioned narrative holds true in the case of the Baltic economies. That is, it will check the validity of the argument that the pre-crisis convergence of the Baltics with the EU countries was conjunctural, which would mean that the conditions for an OCA were not satisfied over time, and that this was largely revealed by the adverse impact of the 2008 financial crisis. In fact, the divergence of these countries from the euro area after the outbreak of the crisis is reflected in the strong recovery from the sharp real GDP contraction they had experienced in 2009, as opposed to the anaemic rebound of euro area economies. More specifically, as seen in Chart 3, although the 2008 crisis caused real GDP in 2009 to fall more sharply in the Baltic countries (-14.5%) than it did in the euro area (-4.5%), the former recovered very strongly and soon. On the other hand, the euro area economies took a quite different path, with a lacklustre initial recovery followed by a relapse to recession. Therefore, the divergence between the two blocs also seems to be linked with the better performance of the Baltic economies, compared with the euro area. For this reason, the periods before and after the onset of the crisis will be examined separately in the analysis below.

Chart 1 Baltic countries: Trade openness

((exports+imports)/GDP, period averages)

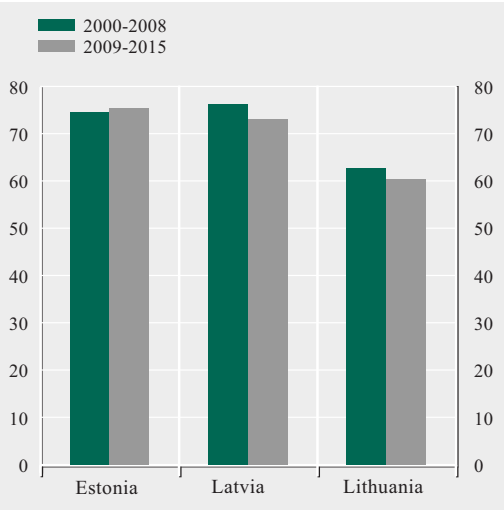


Source: AMECO.

2 Estonia in 2011, Latvia in 2014 and Lithuania in 2015.

Chart 2 Baltic countries: trade with the EU

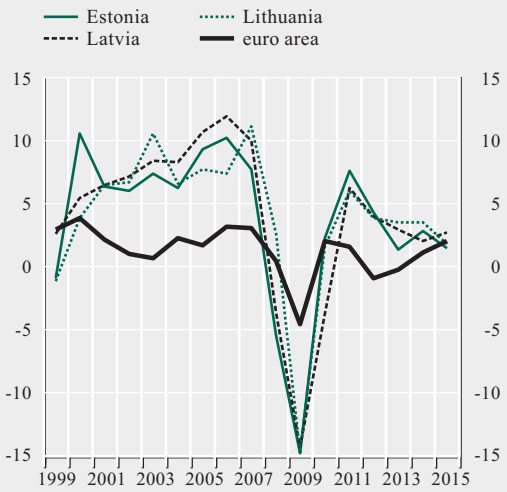
(% of their total trade flows, period averages)



Source: AMECO.

Chart 3 Real GDP

(annual percentage changes)



Source: AMECO.

Our methodology is based on the theory of Purchasing Power Parity (PPP),[3] in particular, on the simple assumption that, in an economically well-integrated monetary union, the real exchange rates of its member countries are expected to converge. In other words, if the economies meet the criteria for joining a monetary union, any shocks will be symmetric and their macroeconomic variables will co-move.

Specifically, according to the theory of Generalised PPP (G-PPP), if the fundamental economic variables determining the real exchange rates of a group of economies are non-stationary, then the real exchange rates of these economies are also non-stationary. Nevertheless, if these variables tend to share common trends in the long run, they can still form a cointegrating relationship (Enders and Hurn 1994). In this case, the relevant economies are likely to constitute an OCA, if they face similar real disturbances (Mundell 1961).

Finally, it should be noted that the econometric model used, apart from examining whether a G-PPP relationship exists between the real exchange rates of the three Baltic countries against the euro, is also used to determine whether a similar relationship exists between their real exchange rates against the US dollar. The purpose of this latter empirical investigation is to cross-check the findings of the analysis, given that the Baltic countries used the US dollar as an anchor currency in an early stage of their transition process and before the emergence of the euro, although their trade relations with the United States are limited, particularly in comparison with their trade with the EU.

This article is structured as follows: The next section reviews the theoretical framework. Section 3 presents the data and the econometric methodology. Section 4 reports the empirical results. Finally, Section 5 concludes.

2 THE THEORY OF GENERALISED PURCHASING POWER PARITY

In the OCA literature, the theory of Generalised Purchasing Power Parity (G-PPP) is the

3 The choice of method was largely determined by the availability of the monthly price and exchange rate data needed to ensure a sufficiently large number of observations, and was also based on reliability considerations related to the increased transparency of exchange rate and price level data.

most commonly used theory for testing whether a group of countries form a currency area.

The G-PPP theory was introduced by Enders and Hurn (1994) and is based on the following idea: It could be that the fundamental economic variables determining the real exchange rates of a group of countries are non-stationary, and consequently the real exchange rates of the countries are non-stationary; nevertheless, if the fundamentals are sufficiently integrated, the real exchange rates will share common trends and therefore will converge towards a long-run equilibrium relationship (i.e. they will form a cointegrating relationship). If this holds true, the economies will constitute an optimal currency area in the sense of Mundell (1961), who argues that two or more economies constitute a currency area if they face similar real disturbances. The theory also suggests that, when economic interdependence in a group of economies is high, an economy's bilateral real exchange rate is influenced by the exchange rates of the other economies in the group and the fundamentals of the other economies.[4]

Testing for G-PPP initially entails univariate stationarity analysis of the individual real exchange rate series. The real exchange rate (R) is calculated as:

$$R = S\ (P / P^{*}) \qquad (1)$$

where S is the nominal exchange rate (the value of the domestic currency expressed in terms of the foreign currency), P^{*} is the general level of prices in the foreign country and P is the general level of domestic prices. An increase (decrease) in the real exchange rate means depreciation (appreciation) of the domestic currency.

A stationary real exchange rate implies that PPP holds between a given pair of countries (i.e. changes in the ratio of their national price levels are mirrored by changes in the nominal exchange rate between the relevant currencies), which, in turn, indicates that these countries are connected by strong trade and finance links and that their economies are converging towards each other. By contrast, a non-stationary real exchange rate would prima facie suggest an absence of strong finance links between the two countries. Nevertheless, non-stationary real exchange rates can still share common trends in the long run, which is evidence of economic convergence/integration between the economies and the existence of a currency area.

Specifically, following the notation of Enders and Hurn (1994), G-PPP can be described as follows: given a n-country world, a m ($m \leq n$) country currency union exists when G-PPP holds, such that a long-run equilibrium relationship exists between the m–1 bilateral exchange rates, of the form:

$$r_{2jt} = a + b_{3jt}r_{3jt} + b_{4jt}r_{4jt} + b_{5jt}r_{5jt} + \ldots\ldots + b_{mjt}r_{mjt} + e_t \qquad (2)$$

where r_{ijt} is the log of the bilateral real exchange rate in period t between Country j and Country i; a is the intercept term; b_{ijs} are the parameters of the cointegrating vector, which represent the degree of comovement of the real exchange rates; and e_t is a stationary stochastic disturbance term. The b_{ij} parameters reflect the economic interdependencies within the group of economies. Enders and Hurn (1994) show that the estimated b_{ijs} are closely linked to the aggregate demand functions of a goods market-clearing relationship. They also indicate that the more similar the aggregate demand functions in each country of the group, the lower the b_{ijs} in magnitude.

Numerous empirical studies have used the G-PPP theory to test whether a group of countries with common characteristics form an OCA (see e.g. Sarno (1997), who focuses on EMS countries; Antonucci and Girardi (2006) on EMU countries; Kawasaki and Ogawa (2006), Wilson and Choy (2007) and Nusair (2012) on Eastern Asian countries; Neves et al.

4 The idea that third-country effects should be taken into account when testing for bilateral PPP within a system of countries is further developed by e.g. Sideris (2006b).

(2007) on Mercosur countries; and Sideris (2011) on Central European countries in relation to the euro area).

3 DATA AND ECONOMETRIC METHODOLOGY

In this empirical investigation, we use monthly observations for the nominal exchange rates of the domestic currency of each Baltic country vis-à-vis the euro and the US dollar, respectively. For the calculation of real exchange rates, we use the consumer price indices (CPIs). The choice of CPIs is explained by the fact that these measures are published for all countries, ensuring a large sample of data compiled by a broadly similar methodology.[5]

The sample period is determined by CPI data availability. In particular, monthly CPI data are available for the period from February 1995 to November 2014 (258 monthly observations). The sources of data are the IMF International Financial Statistics (IFS) online database and Eurostat.

The price indices (P) refer to monthly data with 2005 as base year (2005=100). The nominal exchange rates (S) of the three Baltic countries are end-month.[6] The real exchange rate (R) of each Baltic country is derived from its nominal exchange rate adjusted for prices. The logs of the real exchange rate series are denoted by r_{ij}, where the subscript i takes the values la, li and es for Latvia, Lithuania and Estonia, respectively, and the subscript j takes the values € και $ for the euro and the US dollar, respectively. The nominal exchange rate series are taken from the monthly database of the Vienna Institute for International Economic Studies (WIIW).

To explore the potential relevance of the 2008 crisis, the analysis is carried out (i) for the pre-crisis or pre-onset period, from February 1995 to September 2008 (164 observations), and (ii) for the post-onset period, from October 2008 to November 2014 (74 observations).[7]

We first test for stationarity of the euro (and the dollar) real exchange rate series of Latvia, Lithuania and Estonia, applying unit root tests. If non-stationarity is established, we test whether a G-PPP relationship exists between the Baltics and the euro area (the US economy), using the Johansen (1995) cointegration technique.

4 EMPIRICAL RESULTS

4.1 UNIT ROOT TESTS

In order to test for stationarity of the individual data series, we apply the Elliott-Rothenberg-Stock (ERS) test (see, inter alia, Neves et al. 2007). In the regressions of the series, we include a constant and a trend based on tests for their statistical significance. The lag length (known to have an impact on the results of the unit root tests) is selected based on the Schwarz Information Criterion (SIC). The regressions are estimated using spectral ordinary least squares (OLS). The test results, which are shown in Table 1, provide evidence that all series are I(1).[8]

According to the results for the euro real exchange rate series of Lithuania ($r_{li€}$), Latvia ($r_{la€}$) and Estonia ($r_{es€}$), as shown in Table 1A, the ERS test statistics (P-stats) take the values: $P_{li€}$=110.06 (Lithuania), $P_{la€}$=78.90 (Latvia) and $P_{es€}$=282.60 (Estonia), which are higher in absolute terms than the critical value of the test (5.65) at the 5% level of significance. Hence, the null hypothesis (H_0) cannot be rejected, and we conclude that the variables $r_{li€}$, $r_{la€}$ and $r_{es€}$ are non-stationary in levels. Non-stationarity implies that a series has at least one unit root,

5 The Harmonised Index of Consumer Prices (HICP) would have been even more relevant, but is available for a smaller sample of observations.
6 For the period up to end-December 1998, the exchange rates of the currencies of the Baltic countries are expressed in relation to the European currency unit (ECU). The nominal effective exchange rates of the Estonian kroon and the Latvian lats against the US dollar as from December 2010 and December 2013, respectively, are expressed by reference to the euro/dollar parity.
7 The financial crisis began in September 2008 with the collapse of Lehman Brothers.
8 The results are consistent with the findings of Sideris (2006a) and Hsing (2008).

Table 1 ERS unit root tests (February 1995-November 2014)

A. Real exchange rates vis-à-vis the euro					
		Testing for unit root in:			
		Levels		First differences	
Variable	Intercept terms	P-statistic	Critical value (5%)	P-statistic	Critical value (5%)
$r_{li€}$	c, t	110.06	5.65	*0.91*	5.65
$r_{la€}$	c, t	78.90	5.65	*0.99*	5.65
$r_{es€}$	c, t	282.60	5.65	*1.40*	5.65
B. Real exchange rates vis-à-vis the US dollar					
		Testing for unit root in:			
		Levels		First differences	
Variable	Intercept terms	P-statistic	Critical value (5%)	P-statistic	Critical value (5%)
$r_{li\$}$	c, t	19.17	5.65	*0.79*	5.65
$r_{la\$}$	c, t	14.05	5.65	*1.08*	5.65
$r_{es\$}$	c, t	11.40	5.65	*0.97*	5.65

i.e. it is at least integrated of order one (I(1)), without precluding a higher order of integration. To determine the order of integration of $r_{li€}$, $r_{la€}$ and $r_{es€}$, the test is repeated using the first differences of each variable, which we denote by $\Delta r_{li€}$, $\Delta r_{la€}$ and $\Delta r_{es€}$. The ERS test statistics now take the values $P_{li€}$=0.91 (Lithuania), $P_{la€}$=0.99 (Latvia) and $P_{es€}$=1.40 (Estonia), which are far lower in absolute terms than the critical value (5.65) at the 5% level of significance. Hence, the null hypothesis (H_0) is rejected, and we conclude that the variables $\Delta r_{li€}$, $\Delta r_{la€}$ and $\Delta r_{es€}$ are stationary. It ensues that $r_{li€}$, $r_{la€}$ and $r_{es€}$ are integrated of order one (I(1)).

Table 1B reports the results of the unit root tests for the real exchange rate series of Lithuania ($r_{li\$}$), Latvia ($r_{la\$}$) and Estonia ($r_{es\$}$) vis-à-vis the US dollar. All three series are found to be integrated of order one (I(1)).

4.2 TESTING FOR G-PPP USING COINTEGRATION ANALYSIS

Cointegration ranks

In this section, we investigate whether a long-run equilibrium G-PPP relationship of the type described in equation (2) exists between the real exchange rates. The analysis tests for cointegration using the Johansen VAR methodology (Johansen 1995). The number of lags included in the VAR systems is determined by the Akaike Information Criterion (AIC). Under this approach, the number of cointegrating relationships is identified using the Johansen's trace and maximum eigenvalue (Max-Eigen) tests. For each set of real exchange rates (i.e. vis-à-vis the euro and the US dollar, respectively), cointegration analysis is performed for two different periods, i.e. before and after the onset of the crisis.

The results on the existence of a G-PPP relationship between the real euro exchange rates are reported in Table 2. Both tests indicate the presence of one cointegrating vector in the system for the pre-onset period, i.e. February 1995-September 2008 (see Table 2A).[9] The results provide support to the existence of an equilibrium relationship for the period before the onset

9 The estimated trace statistics (34.82) is greater than the critical value at the 0.05% confidence level (29.80), thus leading to the rejection of the null hypothesis of no cointegration (H_0). Likewise, the maximum eigenvalue (23.17) exceeds the critical value at the 0.05% confidence level (21.13).

Table 2 Cointegration analysis: real exchange rates vis-à-vis the euro

A. February 1995-September 1998				
Rank	Maximum eigenvalue	Critical value (95%)	Trace	Critical value (95%)
0	*23.17**	21.13	*34.82**	29.80
1	8.66	14.26	11.66	15.49
2	3.0	3.84	3.0	3.84
B. October 2008-November 2014				
Rank	Maximum eigenvalue	Critical value (95%)	Trace	Critical value (95%)
0	**14.60**	21.13	**21.46**	29.80
1	6.20	14.26	7.01	15.49
2	0.38	3.84	0.38	3.84

* Denotes rejection of the hypothesis at 0.05 significance level.

of the crisis. In other words, the cointegration analysis shows that the Baltic countries meet the conditions for an OCA with the euro area during the pre-onset period: the real exchange rates appear to be closely integrated and form a G-PPP relationship during this period.

By contrast, the results for the post-onset period (October 2008-November 2014), as reported in Table 2B, do not suggest an equilibrium relationship: neither the trace test nor the maximum eigenvalue test provide evidence of cointegration[10] or long-run interaction among the exchange rates.

Overall, the test findings suggest that the Baltics did form an OCA with the euro area before the crisis, but not afterwards. As far as the pre-crisis period is concerned, this would mean that the negative impact of the fact that these economies were at the time undergoing transition to market economy was fully offset by the positive impact of: (a) their high degree of economic integration with the countries of the euro area; (b) the stability of their nominal exchange rates vis-à-vis the euro under their respective national exchange rate policies; (c) the considerable flexibility of their institutional framework, in particular regarding the labour market; and (d) a favourable economic conjuncture characterised by the absence of major symmetric shocks, especially after 2000 and until the outbreak of the Great Crisis. However, according to the empirical results, this situation changed with the outbreak of the 2008 crisis, after which economic activity developments diverged between the Baltic States and the euro area, as a result of asymmetric shocks.

The cointegration test results for the real exchange rates vis-à-vis the US dollar, as reported in Table 3, do not point to a long-run relationship between the exchange rates, and in this sense, they are in line with expectations. As can be seen, there is no cointegration among the exchange rates in either the pre-onset or post-onset period.[11] The real exchange rates do not share common trends or converge towards one another.

The long-run relationship: Long-run elasticities

Table 4 shows the estimated cointegrating vector, which describes the G-PPP relationship

10 The estimated trace statistic (21.46) is lower than the critical value at the 0.05% confidence level (29.80). Likewise, the maximum eigenvalue statistic (14.46) falls short of the critical value (21.13). Thus, based on both tests, we accept the null hypothesis of no cointegration (H_0).

11 For the pre-onset period, the trace statistic (14.55) is lower than the critical value at the 0.05% confidence level (29.80). Likewise, the maximum eigenvalue statistic (8.74) is lower than the critical value (21.13).

Table 3 Johansen tests for cointegration rank: real exchange rates vis-à-vis the US dollar

A. February 1995-September 1998				
Rank	Maximum eigenvalue	Critical value (95%)	Trace	Critical value (95%)
0	8.74	21.13	14.55	29.80
1	4.03	14.26	5.80	15.49
2	1.77	3.84	1.77	3.84
B. October 2008-November 2014				
Rank	Maximum eigenvalue	Critical value (95%)	Trace	Critical value (95%)
0	9.78	21.13	16.89	29.80
1	6.54	14.26	7.11	15.49
2	0.57	3.84	0.57	3.84

Table 4 Estimated cointegrating relationship

Real exchange rates vis-à-vis the euro (February 1995-September 2008)			
	$r_{es€}$	$r_{la€}$	$r_{li€}$
Coefficient	1	-0.09	0.19
t-stats		-3.70	2.64
Standard deviation		0.024	0.073
Probability		0.0003	0.009

between the three real euro exchange rates for the period February 1995-September 2008. This relationship can be normalised on the Estonian kroon/euro real exchange rate, in order to reflect a simplified form of the inter-relationship among these rates.[12] The estimated coefficients can be interpreted as long-run elasticities. All coefficients are statistically significant at the 5% level.

The estimated coefficients are less than unity. In the long-run relationship, a 1% increase (decrease) in the Estonian kroon/euro real exchange rate is associated with a 0.09% decrease (increase) in the Latvian lats/euro real exchange rate and a 0.19% increase (decrease) in the Lithuanian litas/euro real exchange rate. The low values of the coefficients can be interpreted as evidence of significant homogeneity of the relevant economies. According to Enders and Hurn (1994), the low values of parameters mean that the common path of the exchange rates is the result of significant homogeneity of the relevant economies rather than of mutual interactions between the exchange rates. Assuming that the exchange rates are only influenced by real output processes of the various nations, the normalised vector coefficients will be smaller the more similar are a country's aggregate demand parameters. The results therefore indicate that the Baltic economies share a common structure of aggregate demand.

The adjustment coefficients

Johansen's maximum likelihood technique (Johansen 1995) also estimates the adjustment

12 Normalisation to any of these rates would be possible, by changing accordingly the parameters of the long-run relationship.

straints that the fixed exchange rate regime operated by the Baltic countries imposed on monetary policy. As a result, the Baltic economies followed a path of real convergence with the euro area.

However, with the outbreak of the Great crisis in 2008, it became clear not only that their convergence with the euro area had been overestimated, but also that the risks from the emergence of severe imbalances in these economies had been underestimated. The crisis gave rise to significant asymmetric shocks, which revealed the inadequate degree of convergence of the economies, and this was also reflected in the path of the real exchange rates. More generally, the experience of the crisis showed that the pre-crisis convergence of these economies, which was largely responsible for the build-up of significant, mostly external imbalances, was unsustainable (IMF 2014).[14] Against this backdrop, the crisis plunged the Baltic countries into a deep recession, from which, however, they managed to recover quite soon, thanks to prompt policy responses, including adjustment measures.[15] The euro area economies, on the other hand, followed a different path, as mentioned in the introduction. The results of our research support this narrative, as the methodology applied shows that, in the post-onset period, convergence with the euro area economies was insufficient.

The results indicate that the process of convergence towards the euro area has been weakened in recent years by the impact of the Great crisis of 2008. More specifically, prior to 2008, convergence was promoted by a favourable economic conjuncture, the absence of asymmetric shocks and accelerated economic integration with the EU, largely as a result of the role of the euro in European markets. However, with the outbreak of the financial crisis in 2008, it became clear that the degree of economic integration was lower than pre-crisis convergence would suggest (IMF 2014), with the Baltic economies recovering faster than the euro area.

A similar analysis has also been carried out with respect to the US economy. The results show no alignment between the Baltics and the US economy for either the pre-onset or the post-onset period. This confirms our initial hypothesis that the G-PPP theory does not hold for the United States. The results for the United States largely reflect the weakening of the US dollar in European markets, but also the limited economic integration of the Baltic countries with the United States.

In general, the 2008 crisis demonstrated that the previously achieved convergence between the Baltics and the euro area, though significant, was not sufficient to keep the flaws of the monetary union from coming to light. In our view, the results for the Baltic countries are quite representative of the general situation that prevailed in the euro area for some time after the crisis.

14 According to several analysts, the Balassa-Samuelson effect explained much of the convergence path of transition economies and was used as an alibi for the large imbalances built up before the crisis. The methodology used in this article does not enable to disentangle the significance of this particular effect.

15 One important policy response involved internal devaluation, which led to the speedy recovery in the very sizeable export sectors of these economies.

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