OECD Economics Department Working Papers No. 728

Estonia and Euro Adoption: Small Country Challenges of Joining EMU

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https://dx.doi.org/10.1787/220860037027

OECD

Unclassified **ECO/WKP(2009)69**

Organisation de Coopération et de Développement Économiques
Organisation for Economic Co-operation and Development **20-Apr-2010**

English - Or. English

ECONOMICS DEPARTMENT

Cancels & replaces the same document of 13 October 2009

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by
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JT03282122

Abstract/Résumé

Estonia and euro adoption: Small country challenges of joining EMU

Estonia gave up the exchange rate and monetary policy tools of macroeconomic management when it introduced its currency board in 1992. While the currency board arrangement served the country well during transition in the 1990s, it offers limited flexibility to implement policies that would ease the EU convergence as well as mitigate the global financial and economic crisis.

The ongoing financial crisis has made euro adoption more attractive than ever and put it on the top of the country's policy agenda. However, shocks affecting Estonia are only weakly synchronized with those of the euro area, and the structure of its economy also notably differs from the euro zone. To benefit fully from joining the EMU, Estonia must strengthen other adjustment mechanisms to shocks, including flexibility of the labour market, further improving its environment to do business and a framework, which allows for anti-cyclical fiscal policies.

This Working Paper relates to the *2009 OECD Economic Survey of Estonia* (*www*.oecd.org/eco/surveys/estonia).

JEL classification: E32; F42; C53
Keywords: business cycle synchronization; EMU; structural VAR; Estonia

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L'Estonie et l'adoption de l'euro : les problèmes que pose à un petit pays l'adhésion à l'UEM

En mettant en place un régime de caisse d'émission en 1992, l'Estonie a renoncé pour sa gestion macroéconomique aux instruments que constituent la politique de taux de change et la politique monétaire. Tout en ayant été très utile pour le pays durant la période de transition des années 90, le régime de caisse d'émission n'offre qu'une souplesse limitée pour mettre en oeuvre les mesures qui faciliteraient la convergence par rapport à l'UE et qui atténueraient aussi la crise financière et économique mondiale.

Du fait de la crise financière actuelle, l'adoption de l'euro est plus attrayante que jamais et est une des priorités du pays. Malgré tout, les chocs que subit l'Estonie ne sont que faiblement synchronisés avec ceux que connaît la zone euro et la structure de l'économie estonienne est également assez différente de celle de l'économie de la zone euro. Pour bénéficier pleinement de la participation à l'UEM, l'Estonie devra renforcer d'autres mécanismes d'ajustement aux chocs économiques ; il lui faudra un marché du travail plus flexible, un environnement plus propice aux activités industrielles et commerciales et un cadre qui lui permette de mener des actions budgétaires anticycliques.

Ce Document de travail se rapporte à *l'Étude économique de l'OCDE de l'Estonie 2009* (www.oecd.org/eco/etudes/estonie).

Classification JEL: E32; F42; C53
Mots clés: synchronisation du cycle conjoncturel; UME; VAR structurelle; Estonie

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ESTONIA AND EURO ADOPTION: SMALL COUNTRY CHALLENGES OF JOINING EMU

by Zuzana Brixiova, Margaret H. Morgan and Andreas Wörgötter[1]

1. Introduction

With introducing the currency board in 1992, Estonia gave up the exchange rate and independent monetary policy tools of macroeconomic management, and approached a monetary policy framework equivalent to unilateral euro adoption.[2] The motivation at that time was to enhance credibility of monetary policy and reduce inflation, at the expense of limited flexibility in responding to future asymmetric shocks with respect to the euro area. As the kroon became a symbol of the Estonian independence, the underlying currency board helped gain support for difficult measures associated with the transition to a market economy (Knöbl, Sutt and Zavoico, 2002). However, in the context of EU convergence, the arrangement has made low inflation more challenging to achieve and thereby encouraged a loose monetary policy stance with predominantly negative real interest rates. It has also limited the possibility to effectively monitor and regulate loans to the private sector as well as extend liquidity to the banking sector in the case of financial crisis.[3]

Since joining the EU, Estonia has viewed the euro adoption as the most appropriate exit strategy from the currency board (Lättemäe and Randweer, 2006). The global financial and economic crisis has made euro adoption even more attractive and put it on the top of the country's policy agenda. The enhanced interest is driven at least partly by the desire to eliminate the exchange rate risk, which was triggered by the loss of competitiveness and became very costly due to the substantial foreign exchange-denominated private debt. At the same time, the recession has put major pressures on the budget. After years of surpassing the fiscal Maastricht criterion by a wide margin, reaching the target in 2009 and beyond will require extraordinary measures and it may still be missed.

The objectives of this paper are twofold. First, using several empirical methods including structural VAR, the paper assesses the current alignment of Estonia's business cycles with those of the euro area. Given that Estonia's macroeconomic policy space is limited, understanding the extent of Estonia's

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1. This Working Paper updates and expands analysis that was originally carried out for the *2009 Economic Survey of Estonia*. During that time Zuzana Brixiova was Head of the Estonia and Czech Republic Desk in the Country Studies Branch of the OECD Economics Department and is now with the University of New York in Prague. Margaret Morgan and Andreas Wörgötter are with the OECD Economics Department. The authors thank Jan Babecky, Andrew Dean, Bob Ford, Jorgen D. Hansen, Baudouin Lamine, Martin Lindpere, Laura Vartia and participants of the 2009 OEI Workshop on Monetary Policy in Central and Eastern Europe for helpful comments. Special thanks go to Josiane Gutierrez for excellent editorial support. The views expressed are those of the authors and do not necessarily reflect those of OECD. E-mail addresses: zbrixiova@unyp.cz; margaret.morgan@oecd.org; andreas.woergoetter@oecd.org.

2. Estonia's currency board was initially pegged to the German mark and since 1999 to euro.

3. In the fall of 2008 a run on one of the branches of a major Nordic bank occurred, but the parent bank supplied liquidity swiftly. In February 2009, the Bank of Estonia strengthened its capacity to provide liquidity by signing a precautionary agreement with the Swedish Central Bank.

alignment is key for determining the role of other adjustment mechanisms. Second, after establishing that Estonia's alignment with the euro area has been low albeit increasing, the paper discusses factors that have likely contributed to the cyclical divergence as well as policies that can help mitigate it.

While the empirical literature on the cyclical alignment of the new EU members with the euro area is substantial, research on Estonia is rather sparse. Moreover, the existing studies often reach opposite conclusions. This paper thus carries out a fresh empirical analysis on the extent of Estonia's synchronization with the euro area, utilizing several methods and more recent data. The paper also examines whether the alignment has increased since the EEK was pegged to euro in 1999 (continuing the Deutschmark peg introduced in 1992). In addition, its contribution to the existing literature lies in new policy insights for Estonia; most of them extend to other small new EU members with fixed exchange rate regimes.

The paper is organized as follows. Section 2 provides a brief overview of the theoretical background; Section 3 conducts the empirical analysis and relates it to the existing literature, Section 4 discusses several factors that have likely contributed to the cyclical divergence and policies that would mitigate them; and Section 5 concludes.

2. Theoretical background

Brief review of the theoretical literature

The analysis below is based on the optimal currency area (OCA) theory, which identifies economic characteristics that enable countries to benefit from monetary integration. The OCA approach emphasizes symmetry of macroeconomic shocks as one of the main considerations for participation in a monetary union. Asymmetric, country-specific temporary shocks would weaken the case for a common currency and increase the need for an independent monetary and exchange rate policy. In sum, the costs of monetary union rise with diverging business cycles. If business cycles are not synchronized, the higher cost of joining monetary union need to be mitigated by other adjustment mechanisms.[4]

Even with asymmetric shocks in place, the tools of macroeconomic policy management can be relinquished in countries with mobile labour (Mundell, 1961), a high degree of economic openness (McKinnon, 1963), and diversification in production and consumption (Kenen, 1969). Other factors that ease monetary integration include flexible wages and prices, financial integration, and counter-cyclical fiscal policy which is effective in stabilizing the economy. However, the original OCA work abstracted from important benefits of integration, most notably enhanced credibility and favourable expectations, but also lower transaction costs and increased political integration.[5]

4. Dooley *et al.* (2004) offer a political economy approach to the choice of exchange rate system. The authors argue that there was no break in the Bretton-Woods system, what happened was that over time Europe as a periphery graduated into the centre, which was previously occupied by the US (dollar) alone. The periphery is concerned with export led growth, while the centre is concerned with the return over investment. Therefore peripheral economies tend to maintain undervalued currencies and embark on an export-led growth strategy, which goes hand-in-hand with current account surpluses, which compensate for the reduced international borrowing capacity of emerging economies.

5. In Italy the euro adoption played a key role in insulating financial markets from disruptive political events, such as collapses of governments, resignations, elections and politically motivated terrorist attacks (Fratzscher and Stracca, 2009a). At the same time, EMU seems to have magnified transmission of political shocks within the euro area (Fratzscher and Stracca, 2009b).

The OCA approach is backward looking and hence cannot address structural and other changes resulting from the monetary integration. In this context, the OCA endogeneity paradigm of Frankel and Rose (1998) argues that some of the OCA criteria, especially the synchronization of business cycles, will become more fulfilled once the country joins a monetary union.[6] In contrast, the specialization paradigm of Krugman (1993) states that business cycles could become more de-synchronized with monetary integration. With intensified trade, countries would draw more on their comparative advantages and become less diversified.[7] In any case though, the desynchronizing impact of trade would likely be outweighed by integration of the legal system, labour and financial markets (Deutsche Bank Research, 2006).

Choice of the exchange rate regime

The OCA approach does not lend itself directly to actual comparison of costs and benefits of a monetary union. However, a simple baseline model pointing to the importance of shock synchronization can be obtained by extending the Kydland and Prescott (1977) and Barro and Gordon (1983) models of inflation, along the lines of Berger, Jensen, and Schjelderup (2001), De Haan and Berger (2003), and Ghosh, Gulde and Wolf (2003). The sections below draw especially on De Haan and Berger (2003), where the monetary policy strives to minimize deviations of output and inflation from their targets. The loss function of the central bank thus takes the following form:

$$L = E\left(\lambda(y - y^*)^2 + \pi^2\right);\ \lambda > 0 \qquad (1)$$

where y is the actual output, y^* the targeted output, π the actual inflation, and λ the weight the policymakers assign to stabilizing the output around the target (the inflation target is zero).

In a small open economy, the output is modelled by a standard short-term Phillips curve $y = y_P + \alpha(\pi - \pi^e) + \varepsilon$, $\alpha > 0$, where $\tilde{y}$ is the equilibrium (potential) output, π^e is the expected inflation, α is the elasticity of actual output w.r.t. unexpected inflation, and ε is an economy-wide shock to output with zero mean and variance σ_ε^2, *i.e.* $\varepsilon \approx N(0, \sigma_\varepsilon^2)$. The targeted output is higher than the

6. Austria is considered to be an example of a country which did not constitute an OCA (with Deutsche Mark) in 1980s, but now forms an OCA with the euro area. Hochreiter and Tavlas (2004) conclude for Austria that: "… the hard peg mattered because it mustered a domestic constituency in favor of change, providing the impetus for the domestic economy to become more flexible so that the peg could be sustained. The hard peg also furnished a disciplinary framework for sound macroeconomic policies."

7. In summary, this paradigm posits that if the country's trade with the common area currency is not intensive and/or it is mostly inter-sectoral, shocks would tend to be asymmetric. The empirical findings show that integration raises share of intra-industry trade in total and therefore shock synchronization. Imbs (2004) found that the share of intra-industry trade in the euro area has increased significantly since 1999. Fidrmuc (2004) showed in his empirical work on central and eastern Europe that the intra-industry trade rather than total trade matters for convergence.

potential, that is $y^* = \beta y_P, \beta > 1$. The model is closed by the purchasing power condition, $\pi = e + \pi^F$, where e is the rate of nominal exchange rate change and $\pi^F = \bar{\pi} + \phi$ is the foreign inflation that exhibits an inflationary bias $\bar{\pi}$ and reacts to a foreign unemployment shock with zero mean and variance σ_ϕ^2, *i.e.* $\phi \approx N(0, \sigma_\phi^2)$ [8]

Floating exchange rate regime

In this case, changes in the nominal exchange rate will fully offset changes in foreign inflation, and the inflation will be determined by the domestic central bank. Solving (1) w.r.t. π (while introducing rational expectations) gives the optimal inflation and the related output:

$$\pi = \lambda\alpha(\beta - 1)y_P - \frac{\lambda\alpha}{1 + \lambda\alpha^2}\varepsilon \text{ and } y = y_P + \frac{1}{1 + \lambda\alpha^2}\varepsilon \tag{2}$$

where $\pi^e = \lambda\alpha(\beta - 1)y_P$ is the expected inflation. This term denotes inflationary bias since it shows that the optimal inflation rises with the potential output, the importance that the policy makers assign to output, and elasticity of output to inflationary surprises. Substituting (2) into (1) yields the equilibrium central bank's loss function under the floating exchange rate regime:

$$L^{FL} = \lambda\left((\beta - 1)y_P\right)^2 + \left(\alpha\lambda(\beta - 1)y_P\right)^2 + \frac{\lambda}{(1 + \lambda\alpha^2)^2}\sigma_\varepsilon^2 + \frac{\lambda^2\alpha^2}{(1 + \lambda\alpha^2)^2}\sigma_\varepsilon^2 \tag{3}$$

Fixed exchange rate regime

Under a credible fixed exchange rate regime, $e = 0$ and the loss of the central bank amounts to:

$$L^{FIX} = (\bar{\pi})^2 + \sigma_\phi^2 + \lambda\left((\beta - 1)y_P\right)^2 + \lambda[\sigma_\varepsilon^2 + \alpha^2\sigma_\phi^2 - 2\alpha\rho_{\varepsilon\phi}\sigma_\varepsilon\sigma_\phi] \tag{4}$$

where $\rho_{\varepsilon\phi}$ is the correlation coefficient of ϕ and ε unemployment shocks in the home country and the country to which the currency regime is tied, and σ_ε and σ_ϕ denote standard deviations of these shocks, respectively.[9]

Welfare comparison of alternative exchange rate regimes [10]

The comparison of loss of welfare under both regimes yields that a benevolent policy maker will prefer the currency board to the floating rates regime as long as the difference of losses from average inflation exceeds those in unemployment and inflation variability. The net gain from switching from flexible to the fixed exchange rate regime thus becomes

8. Timing is as follows: *i)* agents form expectations and sign nominal contracts at the beginning of the period; *ii)* the economy-wide shock materializes; *iii)* the policymakers set the inflation rate.

9. The magnitude of loss arising from output volatility is minimized when supply shocks are completely synchronized.

10. The welfare analysis related to the OCA theory has been also carried out in dynamic general equilibrium models with nominal rigidities (Corsetti, 2008, and others).

$$NG = \left(\alpha\lambda(\beta-1)y_P\right)^2 - (\bar{\pi})^2 - \lambda K + \frac{\lambda\sigma_\varepsilon^2}{(1+\lambda\alpha^2)^2} - \sigma_\phi^2 + \frac{\lambda\alpha^2\sigma_\varepsilon^2}{(1+\lambda\alpha^2)^2} \quad (5)$$

where $K = \sigma_\varepsilon^2 + \alpha^2\sigma_\varepsilon^2 - 2\alpha\rho_{\varepsilon\phi}\sigma_\varepsilon\sigma_\phi$.

Put differently, in the above framework the decision to switch to the fixed exchange rate regime implies that the welfare gains from increased credibility of monetary policy exceed the loss from the inability to use monetary policy for output stabilization. The welfare rises the higher the degree of output shock synchronization between the two countries/regions. Table 1 shows the impact of key parameters on the net gain from adopting a fixed exchange rate regime.

Table 1. Comparative static

Effect of an increase in	On net gain from the fixed exchange rate
Weight assigned to output λ	+
Impact of unexpected inflation on output α	ambiguous
Correlation coefficient of supply shocks $\rho_{\varepsilon\phi}$	+
Variance of output shock in the foreign country σ_ϕ^2	-
Variance of output shock in the home country σ_ε^2	-
Equilibrium output rate y_p	+
Inflation bias of the foreign country $\bar{\pi}$	-

3. How synchronized is Estonia with the euro area?

The interest among policy makers and researches in the cyclical alignment of the new EU members with the euro area started in the 1990s and picked up around the EU enlargement period. It has remained high given that most of the new EU members still have the challenge of joining the EMU ahead of them.[11] The global financial and economic crisis has further heightened this interest as the euro adoption would eliminate the exchange rate risk, put liquidity management under the umbrella of the ECB and thus be particularly desirable in new EU countries with a high share of foreign currency loans, such as Estonia.

The objective of this section is to reassess the similarity of the economic structure as well as shock and business cycle synchronization between Estonia and the euro area. The analysis below shows that country-specific, idiosyncratic shocks prevail in Estonia. The country thus needs to rely heavily on adjustment mechanism such as flexibility of its economy and effective fiscal policy rather than on similarity of its economic shocks and business cycles with the EMU. Nevertheless, the predominance of asymmetric shocks does not seem to be too different from several current euro area members, such as Greece or Ireland, for example.[12]

11. Slovenia joined the euro area in January 2007 and the Slovak Republic in January 2009.

12. For a number of years prior to the global financial and economic crisis, Estonia has been meeting most of the formal criteria of the euro adoption. In the absence of independent monetary policy, the inflation criterion proved to be most elusive. In any case, the economic base of these criteria has been long questioned in the academic literature (Buiter, Corsetti and Roubini, 1993).

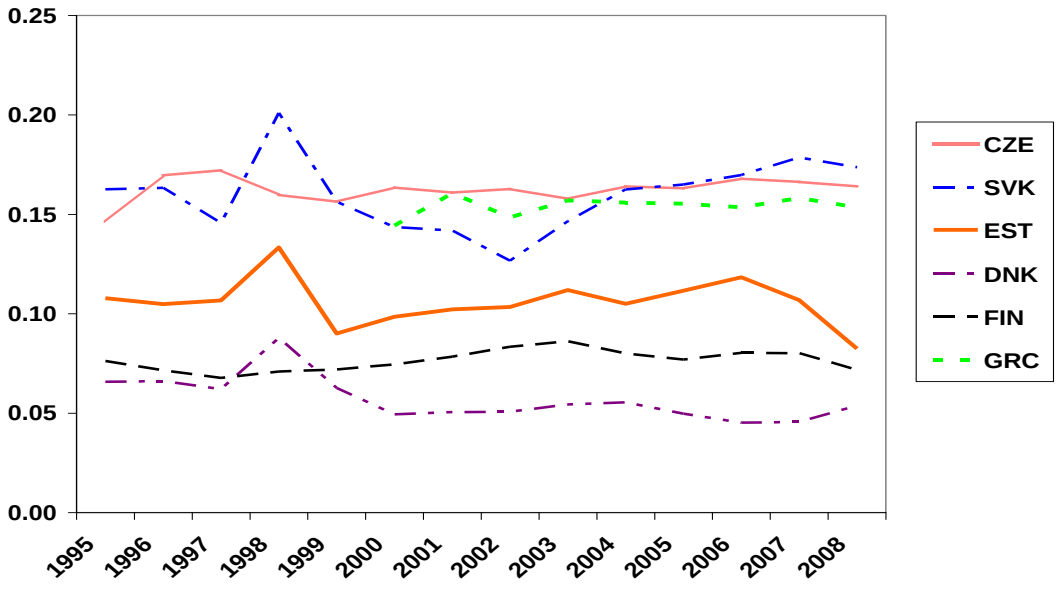
Assessment of Estonia's structural similarity with the euro area

Business cycles may not be synchronized due to asymmetric shocks and/or differences in the transmission mechanisms of common shocks. Structural similarity reduces the impact of these factors. The extent of such similarity between two countries (regions) can be measured either in terms of output (value added) structure or in terms of similarity of trade (intra-industry trade).

Structural similarity reflected by value added

The structural similarity between Estonia (as well as other countries) and the euro area is measured in terms of Bray-Curtis structural similarity index (Figure 1). According to this index, Estonia's production structure is more similar to the euro area's one than the production structure of the Czech Republic to the euro area. However, Estonia's structure is less similar than that of all of the existing EMU countries, except Greece and Slovakia. On balance, the index is relatively low and has exhibited a decline in the last 2 years.[13] The remaining differences are due to high share of trade in services and still somewhat high share of agriculture in total value added.[14]

Figure 1. Bray-Curtis structural similarity index, 1995-2008



Note: The Bray-Curtis structural similarity index is calculated as the ratio between absolute differences and sums of two indicators: $\sum |x_i - y_i| / \sum (x_i + y_i)$. It takes values between [0,1], with the lower values indicating greater structural similarities between the two vectors x and y, the shares of sectoral contribution to total value added in Estonia and the euro area.

Source: Eurostat and authors' calculations.

13. According to Olenko (2006), Estonia differed substantially from EU14 average (EU15 excl. Luxembourg) during 1993-2001. This was due to 2 sets of factors: *i)* Estonia's relatively high share of agriculture in total output and *ii)* concentration of services in transport and communication relative to business activities and health care.

14. The other commonly used measure is the Landesmann structural coefficient, as in, for example, the Czech National Bank (2008). Our results are comparable to those reported by the CNB.

Structural similarity reflected by intra-industry trade

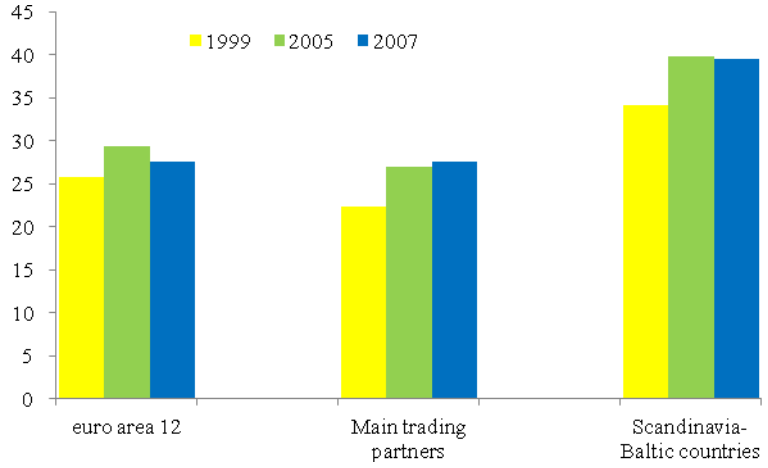
Another indicator of structural similarity is the Grubel-Lloyd Index of intra-industry trade, combined with the indicators of country's share of trade in GDP and intensity of trade with the common currency area. In that regard, Estonia has one of the most open economies among the OECD countries if measured by share of trade in GDP[15]. Estonia's trade with the EU has been intensive and increased over the years – in 2000-07 exports to the EU amounted to over 70% of total exports (Table 2), while imports accounted for about 80% of total imports. However, the share of intra-industry trade has remained low in 2007 (Figure 2), indicating that Estonia's comparative advantages have been more driven by factor endowment than product and process specific specialization and learning by doing.[16]

Table 2. Direction of exports of Estonia, Latvia, and Lithuania, 1994-2007

	Estonia		Latvia		Lithuania	
	1994-99	2000-07	1994-99	2000-07	1994-99	2000-07
	(in % of total exports)					
EU total	65.0	72.9	60.5	75.0	56.7	65.4
Advanced EU	51.2	58.5	39.4	51.0	37.2	41.2
Emerging EU	13.8	14.4	21.1	24.0	19.5	24.2
Russia	15.4	8.2	18.1	9.0	19.8	11.8

Source: Obiora (2009).

Figure 2. Estonia: Grubel-Lloyd index of Estonia's intra-industry trade, 1999-2007



Note: Main trading partners are 32 countries which account for 85% to 90% of Estonia's total trade. Euro area 12 is the euro area 15 used in the VAR analysis except for Luxembourg, Cyprus and Malta. The Grubel-Lloyd index of intra-industry trade in product class i between countries A and B is IIT (i, AB) = 100*(1 - (X(i) - M(i)│ / [X(i) + M(i)])), where X = exports and M = imports (both values).
The results were estimated at the 4-digit level of SITC Rev 3 and aggregated using shares. See OECD Economic Outlook No. 71, June 2002, pp. 159-170

Source: UN Comtrade database and authors' calculations.

15 In 2007 exports and imports amount to about 150% of GDP for Estonia, in between the 165% for Slovakia and 140% for the Czech Republic.

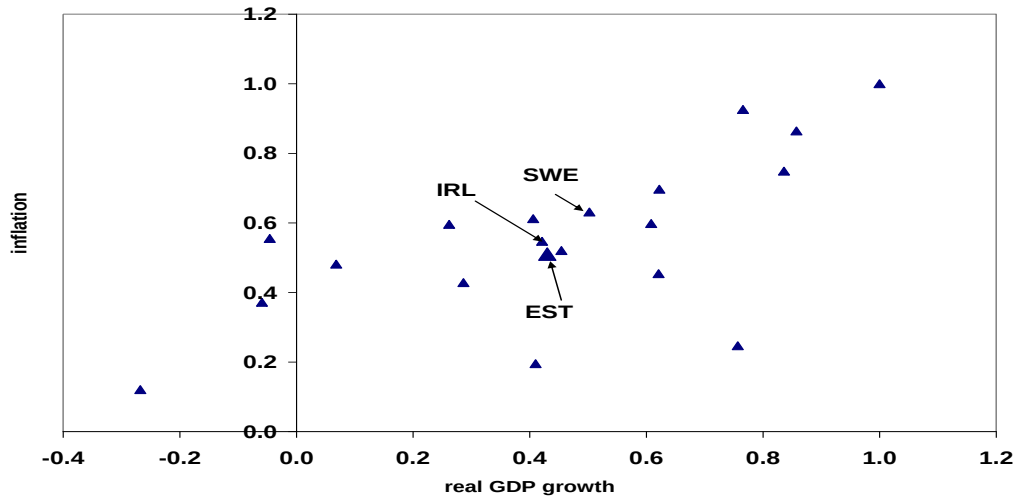
16. High specialization exposes Estonia to risks of external asymmetric shocks (Trotignon, 2003).

Correlation of economic activity

This section utilizes correlation coefficients for output and inflation to determine co-movement between these indicators in Estonia, other EU countries and the euro area.[17]

Estonia's co-movement of real GDP growth and inflation with the euro area countries has been low relative to the most EMU members, albeit comparable to that of some of the smaller ones (Figure 3). Moreover, the movement has increased over time.

Figure 3. Correlation of real GDP growth and HICP inflation with the euro area, 1997-2008



Note: Inflation is the quarterly difference in the annual inflation rate based on the harmonized index of consumer prices (HICP) produced for EU countries. Real GDP growth is quarterly.

Source: Eurostat and OECD National Accounts databases and authors' calculation.

Synchronization of economic shocks

In the sections below, VAR models are utilized to identify the nature of the underlying shocks affecting Estonia's economy and their similarity to those faced by the euro area. Two complementary approaches are adopted: *i)* Choleski decomposition of shocks affecting Estonia's output fluctuations and *ii)* structural VAR to identify the underlying supply and demand shocks. Both methods indicate that Estonia's structural shocks are not particularly aligned with those of the euro area, and that the country-specific factors play an important role.

In the VAR analysis, output and price growth are the first differences of natural logarithms of quarterly real GDP and the GDP deflator respectively. The estimation sample was 1997 Q2 to 2008 Q3. The euro area comprises the 15 members as at December 2008. More details including the estimation results are in the Annex.

17. The drawback of this measure is that it does not capture any dynamics in this co-movement.

Do euro area shocks play a substantial role in Estonia's output fluctuations?

This section conducts variance decomposition of Estonia's output fluctuations through the Choleski decomposition. Variation in the change of the forecast error was decomposed into global, regional and country-specific output shocks. Global shocks are represented by the group of OECD countries, regional ones by the euro area , and the country-specific by Estonia. The following assumptions are made about the nature of these shocks:

- Global shocks affect output in all countries, *i.e.* are due to global events, such as oil price shock or changes in international interest rates;
- Regional shocks affect output in the euro area, and are due to common regional events, such as EU enlargement; and
- Country-specific shocks affect output in individual countries only, and are due to, changes in macroeconomic policy, consumer sentiment, terms of trade shocks or productivity shocks, among others.

A significant role for the regional shocks in Estonia's output fluctuations would indicate that the country meets the shock synchronization criterion of the OCA theory.

Results

In Estonia, domestic shocks accounted for most of the GDP growth volatility during 1997-2008. Euro area shocks accounted for less than 10%.[18] As an alternative to euro area shocks, narrower regional aggregates were calculated for Sweden/Finland. The Sweden/Finland regional shocks also explained only about 4% of the Estonia's output variance, but this increases somewhat if identifying regional growth factors with a Scandinavian/Baltic aggregate. Nevertheless, local factors remain much more important in Estonia than in Finland (Table 3). The important role of Estonia-specific shocks reflects the specificities of transition, the heavy impact of the 1998 Russian crises, and the low share of intra-sectoral trade with the euro area. The results confirm that synchronization of Estonia's cycle with the euro area has been low.

Table 3. Variance decomposition of output growth

Percentage of output variation accounted for by shocks in			
	OECD	Euro area	Estonia
Estonia	**14.6**	**4.6**	**80.8**
	OECD	Euro area	Finland
Finland	43.3	6.9	49.7
	OECD	Scandinavian/Baltic area	Estonia
Estonia	16.0	15.8	68.2
	OECD	Sweden/Finland	Estonia
Estonia	24.1	3.8	72.0

Note: Factorisation used the Cholesky decomposition. Results are reported at the 20th quarter horizon for the variation of Estonia's output.

Source: Eurostat and OECD National Accounts databases and authors' calculations.

18. These results are consistent with IMF (2005), which finds that the country-specific factors explain more than 60% volatility in about 90% of emerging market and developing countries. In contrast, the global factor explains less than 10% of output volatility for more than 60% of the emerging market and developing countries.

The nature and symmetry of Estonia's shocks in comparison with those of the euro area

The objective of this section is to identify whether the shocks affecting Estonia impact aggregate demand or supply and also whether they have become more synchronized over time with those of the euro area. Towards this goal, a bivariate structural VAR model is utilized to recover the underlying demand and supply shocks in Estonia and to determine the degree of their correlation with the euro area shocks.[19]

Our structural VAR model consists of two variables – output growth and inflation, where real quarterly GDP (in log-difference form) and the quarterly GDP deflator (in log-difference form) represent output and prices. Supply shocks are driven by oil prices, changes in technology, and permanent changes to the labour force. Typically, supply shocks represent the structural side of the economy. Demand shocks consist of *i)* real shocks such as changes in consumer confidence, abrupt shifts in government spending, and *ii)* nominal shocks such as changes in expected inflation, monetary policy, or shocks in foreign exchange markets.

More formally, the empirical analysis is based on the aggregate demand-aggregate supply (AD-AS) model:

$$y_t^S = E_{t-1} y_t + \alpha(\pi_t - E_{t-1}\pi_t) + \varepsilon_t^S \tag{6}$$

$$y_t^D + \pi_t = E_{t-1}(y_t^D + \pi_t) + \varepsilon_t^D \tag{7}$$

$$y_t = y_t^S = y_t^D \tag{8}$$

where y_t is the output in period *t*, and $E_{t-1} y_t$ is the *t*-period output expected given information at *t-1*. Similarly, π_t is the inflation during period *t*, while $E_{t-1}\pi_t$ is the inflation expected at *t-1*. The superscripts S and D represent supply and demand, and ε_t^S and ε_t^D denote the (serially uncorrelated) structural aggregate supply and structural aggregate demand shock, respectively.[20]

Equation (6) is the AS curve, where output increases with unexpected inflation and positive supply shocks. The AD increases with its expected value and positive demand shocks (7). Together, the AD-AS presented in (6)-(8) exhibit a systemic relationship between the rate of change in inflation and the level of output in the short run. However, the long-run independence of nominal and real variables holds. In the structural VAR the supply and demand shocks are identified as follows:

- Both supply and demand shocks may have short run effects on output, *y*, and inflation, π.
- Supply shocks have a permanent effect on both output and inflation.
- Demand shocks have permanent effect on inflation, but not on output.[21]

19. The method was pioneered by Bayoumi and Eichengreen (1993), who applied the Blanchard and Quah (1989) identification scheme to the OCA theory. In the empirical OCA literature on the EU accession countries, the method was used by Fidrmuc and Korkohan (2003), and others.

20. The model described by (6)-(8) is a stochastic version of the AD-AS model based on IS-MP-IA framework. It extends into the infinite horizon the system in (1)-(5). A similar framework. has been used to identify supply and demand shock in Cover, Enders and Hueng (2006) and Enders and Hurn (2007). The key difference in our version is utilizing inflation instead of the price level.

21. *Ex-post* sign consistency checks are in the Annex.

Results

Variance decomposition of the structural VAR revealed that supply shocks accounted for most of the real output variability. In contrast, demand shocks accounted for the majority of the variability in prices. Estonia's results are compared with those of Finland (Table 4).

Table 4. Variance decomposition of output growth and inflation (in percent)

	Real output		Inflation	
	Supply shock	Demand shock	Supply shock	Demand shock
Estonia	83	17	24	76
Finland	48	52	45	55

Source: Authors' calculations utilizing data from the OECD National Accounts and Eurostat databases.

Figures 4 and 5 show that demand and supply shocks for Estonia and the euro area have become somewhat more synchronised over time.

Figure 4. Demand shocks of Estonia and the euro area, 1997 Q2-2008 Q3

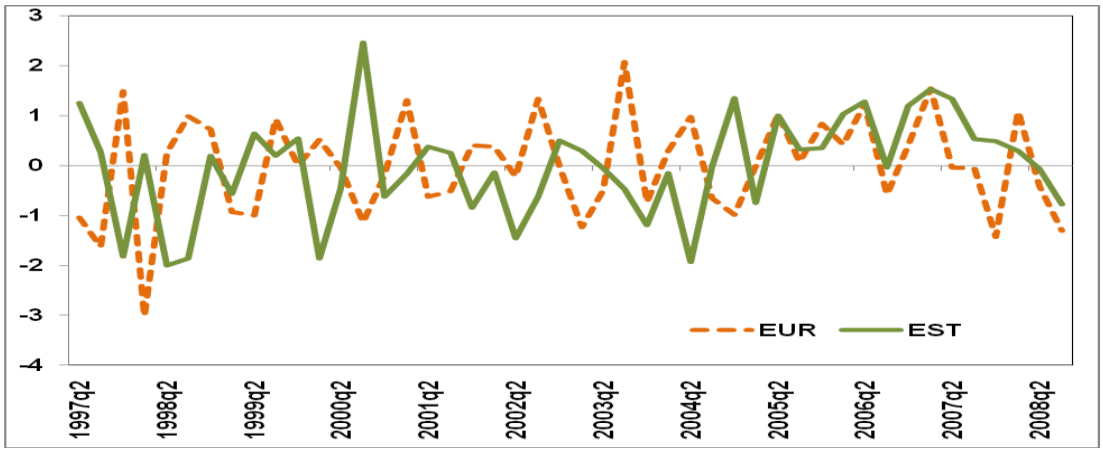
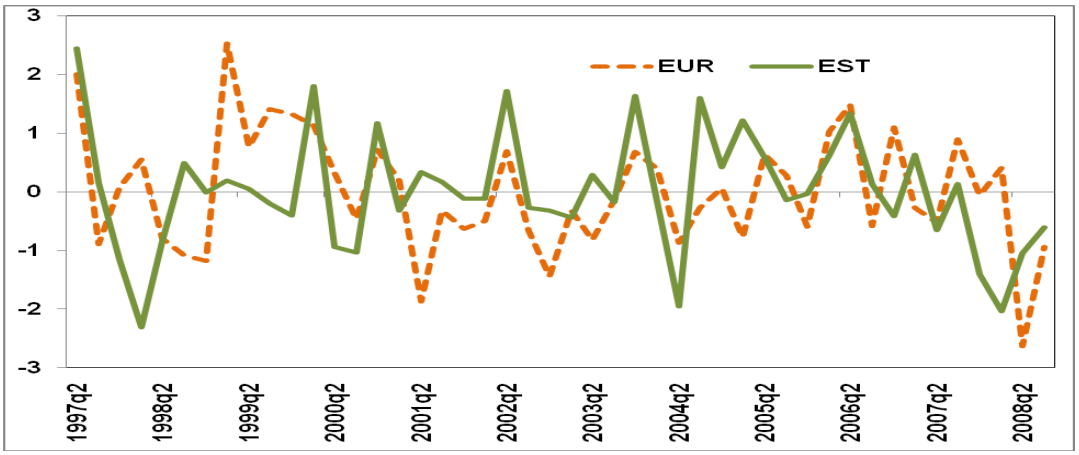


Figure 5. Supply shocks of Estonia and the euro area, 1997 Q2-2008 Q3



Source: Authors' calculations

Table 5 presents correlation coefficients of the supply and demand shocks between several countries (including Estonia) and the euro area. As expected, Estonia's correlation of shocks with the euro area is low relative to other countries. Nevertheless it has been comparable to the Nordic EU countries (Finland, Sweden).[22]

Given the complexity of factors, including politics, that underpin the modern optimal currency area theory, there is no (and cannot be) a benchmark correlation coefficient that would determine that the shock synchronization is sufficient for a country to benefit from joining the common currency area. Nevertheless, the above results are consistent with the conclusion of the previous sections, namely that synchronization of Estonia's shocks and business cycles with those of the euro area is low, albeit gradually increasing. This relatively low synchronization underscores the importance of other adjustment mechanisms, such as flexible labour markets or effective fiscal policies (below).

Table 5. Correlation of supply and demand shocks with the euro area, 1997 Q2-2008 Q3

	1997 Q2-2008 Q3		1997 Q2-2002 Q4		2003 Q1-2008Q3	
	Demand	Supply	Demand	Supply	Demand	Supply
Estonia	-0.20	0.31	-0.50	0.29	0.14	0.34
Finland	0.11	0.13	0.22	0.08	0.03	0.17
Sweden	0.03	0.32	-0.07	0.24	0.11	0.41
Czech Republic	-0.25	0.18	-0.50	0.24	0.00	0.14
Hungary	0.27	0.30	0.22	0.14	0.35	0.47

Note: Positive numbers indicate symmetry, negative numbers asymmetry of shocks.

Source: Authors' calculations

Comparison of results with the existing empirical literature

Studies on the shock synchronization of the new EU countries with the EMU, utilizing data prior to the crisis (until mid-2008) often reached opposite results (Table 6). Regarding methodology, the first strand of literature typically used a correlation of the aggregate output, the second one examined properties of business cycles using various filters, and the third one utilized structural VAR to recover underlying structural shocks.

Despite their differences, the studies' main findings can be broadly summarized as follows:

i) Shocks of the recently acceded EU countries (including Estonia) tend to be less synchronized with the euro area than shocks of most of the EU15 countries;

ii) Estonia's shocks seem comparable to those faced by the smaller EMU countries (Greece or Portugal);

iii) Synchronization of shocks may have increased somewhat over time, as policies pertaining to transition were replaced by policies and institutions that would facilitate convergence towards the EU.

22. The collapse of the Estonia's real GDP growth in 2009 slowed the convergence to the business cycle of the euro area, as it was notably more severe than in any of the euro area countries.

Table 6. Similarity of shocks and synchronization of business cycles – summary of literature

Study and Author(s)	Methodology	Findings
Fidrmuc and Korhonen (2003)	Correlation and structural VAR	Structural shocks were more asymmetric in EU candidate countries than the euro area.
Lättemäe (2003)	Structural VAR	Real shocks in Estonia comparable to those of some of the smaller EU members.
Trotignon (2003)	Sectoral and geographical indicators of exposure to shocks	Estonia is highly exposed to risks of external asymmetric shocks.
Fidrmuc and Korhonen (2004)	Correlation and structural VAR	Slowdown of 2000-2002 increased heterogeneity of demand shocks.
Horvath and Ratfai (2004)	Correlation and structural VAR	Due to asymmetric shocks that accession countries are exposed to, costly process of adjustment after EMU enlargement likely.
Demyanyk and Volosovych (2005)	Correlations of GDP, consumption growth	Economies with the most volatile and counter-cyclical growth - incl. Baltic states - would benefit from risk sharing within the EU.
Babetskii (2005)	Structural VAR	Synchronization of shocks has increased over time
Eickmeier and Breitung (2005)	Structural factor model	Poland, Slovenia, Hungary and Estonia are more suitable for EMU than others.
Fidrmuc and Korhonen (2006)	Meta-analysis	Several current members of the euro area appear to have lower business cycle correlations than new EU members.
Darvas and Szapary (2008)		Volatility in NMS (incl. Estonia) has been reduced, but is higher than in the euro area.
Levasseur (2008)	Structural VAR	Estonia had increasingly negative correlation of supply shocks with the Euro area..
Obiora (2009)	Structural VAR	There are significant spillovers to the Baltics from key trading partners with those from the EU outweighing those from Russia.
Fadejeva and Melihovs (2009)	Dynamic factor model	After 2000, economic developments between the Baltic States and the main euro area countries became more synchronized.

5. Divergence, policies, and trade-offs involved in euro adoption after the crisis

Sources of cyclical divergence

While business cycles are more synchronized between countries that have substantial bilateral trade and financial flows, procyclical fiscal policies and labour market rigidities contribute to cyclical divergence (Artis, Fidrmuc and Scharler, 2008). In the case of Estonia, *fiscal policies* of adhering to the rule of annually balanced nominal budget have been procyclical and slowed convergence of the country's business cycle to that of the euro area. While the fiscal discipline resulted in Estonia's lower public debt than in most advanced and emerging market economies, it has also contributed to the excessive volatility of output (OECD, 2009).

A key factor of Estonia's cyclical divergence from the euro area has been the *unsustainable current account deficit*, fuelled by large capital inflows (Figure 6). Since the inflows financed mainly the investment in the non-tradable sector, particularly real estate and construction, they have not directly increased Estonia's productive and export capacity. In fact, the inflows have contributed to real exchange rate appreciation and erosion of competitiveness. The current account deficit thus widened further, creating a vicious cycle.[23] Moreover, as the inflows increasingly consisted of loans, the private external debt soared and the country's international investment position weakened (Brixiova, Vartia and Wörgötter, 2009).

Another important factor hampering greater cyclical synchronization was *skyrocketing house prices*. Specifically, from 2000 to 2007, Estonia's real estate prices were among the fastest-growing in Europe. At

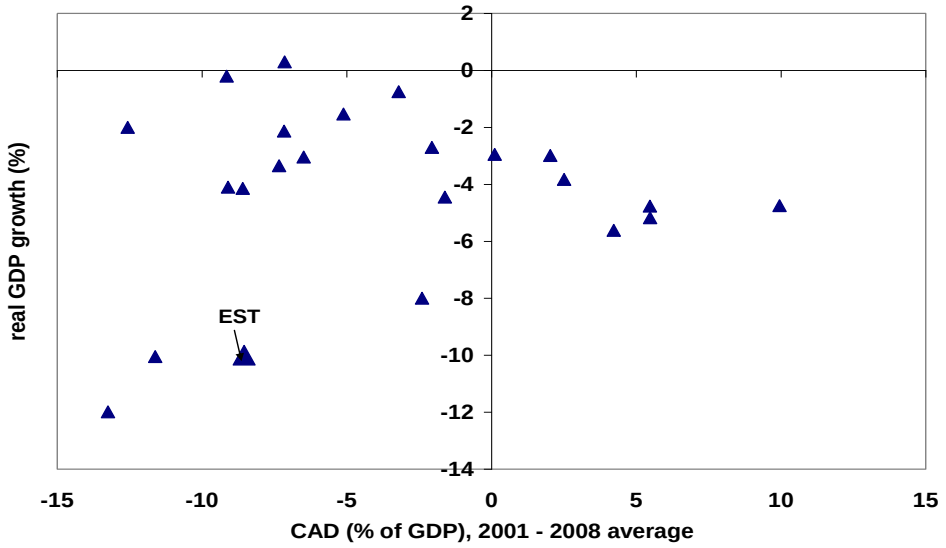
23. Arnold *et al.* (2009), Table 3, show Estonia among countries where a rapid narrowing of the GDP *per capita* gap was accompanied by a significant deterioration of the current account.

the end of 2007, a sudden reversal of this trend occurred, triggered by tightened lending conditions, which reflected loss of confidence of foreign banks in Estonia's longer term growth potential (OECD, 2009).[24]

Policies to encourage cyclical convergence

During the 2000s, fiscal policies amplified already highly pro-cyclical capital inflows. The tightening measures adopted at the end of 2008 and early 2009, aimed at reaching the Maastricht fiscal criterion, were implemented despite the GDP collapse. Nevertheless, at -3% of GDP in 2008, the fiscal balance reached its first serious deficit since the Russian crisis. In 2009, the deficit is projected to exceed the 3% of GDP limit. The recession thus presents the opportunity to gradually phase out the fiscal rule of balancing the annual budget and move to balancing over the cycle. To maintain the hard-won credibility of the fiscal policy, the deficit target could be anchored in a medium-term framework incorporating expenditure ceilings (OECD, 2009).

Figure 6. Current account deficits (2001-08) and forecasted real GDP growth (2009)



Source: IMF WEO database and authors' calculations.

While the Estonian *labour markets* are already flexible in many aspects as indicated by the favourable aggregate outcomes, persistent regional differences in employment and especially unemployment point to remaining rigidities in specific areas. Moreover, outcomes for low-skilled and young workers have improved only marginally, while skill and labour shortages led to wage increases far above productivity growth during 2005-07. More flexible labour markets, and in particular wage growth reflecting productivity increases in the private sector, will be needed to absorb asymmetric shocks. Barriers to internal mobility will also need to be reduced for smooth euro adoption, given the severely restricted macroeconomic policy tools (Brixiova, 2009).

Flexibility of the product markets could be also enhanced. According to the *product market regulation* (PMR) index, Estonia's policies restrict competition almost as much as in the OECD countries on average. This relatively high regulation of product markets leaves room for catching up with the best performers in this area, such as the United States or the United Kingdom (OECD, 2009). For example, Estonia (similarly to other EU countries) needs to make further progress in deregulation of operation of network sectors.

24. However, the rapid growth of house prices in Estonia reflected in part significant housing undervaluation in the early 1990s, distorted by voucher privatization (Lamine, 2009).

Further reforms in other services sectors, such as retail distribution and professional services, also constitute a priority (Arnold, Höller, Morgan and Wörgötter, 2009).

Trade-offs involved in the euro adoption in the light of the crisis

For a small open economy such as Estonia, the case for adopting euro quickly has always been strong, especially since the role of the exchange rate in Estonia has been replaced by flexible prices and wages. With the Estonian kroon pegged to the euro, most of the cost of joining the EMU in terms of loss of independence of monetary policy has already been paid (OECD, 2009). Hence the euro adoption in the near future in Estonia would not come at price of the loss of utilizing monetary policy to ease the recovery, such as in Poland (Hunter and Ryan, 2009) or the Czech Republic. In fact, the global financial and economic crisis has made euro adoption even more attractive for Estonia, partly as a way to protect the country from possible speculative attacks and financial destabilization.

In the context of the global financial and economic crisis, the early euro adoption – as early as in 2011 – has again become one of the top policy priorities (Bank of Estonia, 2009).[25] At the same time, the crisis has made the Maastricht criteria more difficult to fulfil. After years of Estonia's exceeding most of the criteria, meeting them in 2009 and 2010 will pose a challenge. Moreover, the political climate has certainly not become more conducive to the expansion of the euro zone. Current members of the EMU remain lukewarm to the idea of easing the terms of euro adoption for the new EU members, while the crisis makes it more difficult to reach some of the entry criteria.

6. Conclusions

In joining the European Union in 2004, Estonia agreed to replace its national currency by the euro at some future point. In reality, euro adoption has been Estonia's long-term policy priority. While the currency board has served the country well in terms of credibility of monetary policy and stabilizing the economy during the transition period of the 1990s, it prevents full adoption of measures that could mitigate the ongoing global financial and economic crisis. With the crisis posing a heavy burden on the Estonian economy and the significantly reduced external imbalances, joining the EMU has become more desirable for Estonia than ever, especially since most of the costs have already been incurred.

However, as shown in this paper, shocks affecting Estonia's economy are only weakly, although increasingly, synchronized with those of the euro area. The structure of the Estonian economy is also notably different from that of the euro zone. Consequently, joining EMU would require that Estonia strengthens non-monetary national adjustment mechanisms to shocks, particularly flexibility of the labour market and effectiveness of fiscal policies. In the context of the crisis, fiscal policy faces a particular dilemma as countercyclical measures would violate the fiscal Maastricht criterion, while helping the country weather the recession. This dilemma is particularly difficult as there are no indications that the prevailing political climate at the European Union level would allow for fast EMU enlargement of the new members by easing the terms of the euro adoption.

25. The Estonia policymakers do not envisage any changes to the prevailing monetary framework. They also intend to adopt the euro at the current exchange rate of the Estonian kroon.

ANNEX

Data and tables of results referred to in this Annex are in a related Excel file on the website of the OECD Economics Department Working Papers.

VAR methodology

A bivariate vector autoregression (VAR) is a system of 2 equations involving the 2 variables, lags of the variables and residuals. When the variables are stationary the VAR can be expressed in moving average form, *i.e.* in terms of the contemporary variables and the VAR residuals (contemporary and lags). These residuals are usually contemporaneously correlated. However independent residuals (often referred to as shocks) are required for structural analysis. It is therefore necessary to factorise the VAR residuals into independent components. Two methods of doing this are a recursive Choleski decomposition and an identified (structural) VAR. The response of each variable to an impulse in the independent components (shocks) can then be estimated and the variance in forecast errors can be decomposed into contributions by the shocks.

The estimated structural VARs for GDP growth and GDP (or HICP) inflation follow the standard Blanchard & Quah (1989) methodology for identification by assuming that:

i) the variance-covariance matrix of structural shocks is diagonal and normalized;

ii) the demand (inflation) shock has no effect in the long-run on output growth.

Ex-post check of sign consistency

While the structural VAR identification scheme used above does not impose any sign restrictions on responses of inflation and output to shocks, these restrictions are helpful in ex-post verification of the results below, as in Bayoumi and Eichengreen (1993). The predicted and the actual responses of output and inflation to positive demand and supply shocks are:

Table A1. Predicted and actual responses of Estonia's output and inflation to shocks

		Predicted response		**Actual response**	
Responses	Shock	Short-run	Long-run	Short-run	Long-run
Output response to positive	AS	positive	positive	positive	positive
	AD	**positive**	neutral	**negative**	neutral
Inflation response to positive	AS	negative	negative	negative	negative
	AD	positive	positive	positive	positive

As Table A1 shows, almost all Estonia's impulse responses to the demand and supply shocks were consistent with the predictions. One exception was the negative reaction of output to positive AD shock, as in recent years the negative supply shock offset the AD stimulus. In contrast, when HICP is used as the price level, actual responses match those predicted (see **Table A6** of the Annex).

Data

Output was measured by quarterly, seasonally adjusted, real GDP. The price level was measured by the quarterly, seasonally adjusted, GDP deflator. In addition, for Estonia and the euro area, price was measured by the quarterly non-seasonally adjusted harmonized index of consumer prices (HICP). GDP and its deflator were available for 1995 Q1 to 2008 Q3 except for the OECD and the Czech Republic for which the first observation was 1996 Q1. HICP was available for 1996 Q1 to 2008 Q3. Data sources were Eurostat, OECD National Accounts and Statistics Estonia databases. The euro area used was the 15 members as at December 2008, namely Austria, Belgium, Cyprus, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Malta, Netherlands, Portugal, Slovenia and Spain. The Scandinavia-Baltic area used was Denmark, Finland, Latvia, Lithuania, Norway and Sweden.

Estimations

First differences of the natural logarithms of real GDP and its deflator were stationary for all countries or regions except the Czech Republic and Hungary. A linear trend was removed from the quarterly growth of Czech real GDP and the difference in the quarterly growth in the Hungarian GDP deflator was used. The quarterly difference in annual HICP inflation (fourth difference in natural logarithms) was stationary for Estonia and the euro area. Results of the stationarity tests (ADF, KPSS) are in **Table A1** of the Annex.

Appropriate lags were obtained from information and other criteria and are in Annex Table A2. VAR selection was based mainly on significance of individual lags, as well as autocorrelation and normality tests on residuals. The selected number of lags varies from one country to another. The selected (and sometimes restricted) VARs and related diagnostics are in Annex **Tables A3 to A5**. The Jarque-Bera test for normality is always reported. Where skewness or kurtosis was detected, these tests are also reported.

Allowing for one difference in variables and 8 lags gave a maximum estimation sample of 1997 Q2 to 2008 Q3, 46 observations. This sample was used in most estimations since fewer than 8 lags were needed in the VARs.

Estimations were carried out using Eviews version 6 and Stata version 10.1.

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