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Testing the Asymmetry of Shocks with Euro Area

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Abstract. *The objective of this study is to identify the demand and supply shocks affecting 13 EU member states and to estimate their degree of correlation with the Euro area shocks. This research ensures identifying the asymmetry of shocks degree with the monetary union, depending on which it's judging the desirability of adopting a single currency. The analysis is also useful for the economies outside the Euro area, because they are strongly commercial and financial integrated especially with the core economies from union. Applying the Blanchard and Quah methodology to estimate the shocks in the period from 1998:1-2010:3, I have found a weak and negative correlation between demand shocks and a medium to high correlation of the supply shocks. The results obtained suggest the presence of a structural convergence process with the Euro area, in the context of domestic macroeconomic policies rather different, both inside and outside the monetary union.*

Keywords: demand shocks; supply shocks; SVAR model; Euro area; asymmetric shocks.

JEL Codes: E32, E37.
REL Codes: 9B, 9G.

Introduction

Adopting the Euro entails giving up two instruments that can be used to neutralize macroeconomic shocks. These shocks will become more rather asymmetric, given that there are significant differences with the Euro area's economic structure or it is promoting divergent macroeconomic policies than this. The event of asymmetric shocks will generate a lower correlation of business cycles, increasing the costs of participating in monetary union. To identify the relationship between economic shocks and business cycles, the economic literature is using several methods of the shocks decomposition that affect some nominal and real variables. The most used methodology is that of Blanchard and Quah (1989), further developed by Bayoumi (1991) and Bayoumi and Einchengreen (1992). This concerns the decomposition of the shocks that affects output and inflation in aggregate demand, respectively aggregate supply shocks. This methodology is useful to analyse the risks of a common currency adopting, because it allows identifying the nature of shocks and the most appropriate answers to their action. Bayoumi and Einchengreen have investigated two types of shocks with two type VAR models, one for real GDP and the other for the GDP deflator. The shocks were estimated based on residuals of the two models, with the restrictions specified in the next section of the paper.

The two economists have estimated that for the EU countries there are more asymmetric shocks than US regions, this situation leading to difficulties for stability of the European Monetary Union. Moreover, the shocks adjustment is more difficult in European countries, which will lead to the persistence of high unemployment following a restrictive shock. The methodology was used to estimate the impact of enlargement of monetary union with countries from Central and Eastern Europe. Using data for ten economies from this region and the Euro area economy, Fidrmuc and Korhonen (2001) estimated that Hungary, Latvia and Estonia registered a high supply side shocks correlation with EMU in the period 1994-2000. For others countries the correlation of shock was close to zero, suggesting reduced structural convergence of these countries with EMU. Correlation of shocks on the demand side is generally lower than the supply side, low levels of correlation coefficient reflecting the macroeconomic differences during the transition.

Horvat (2000) analyzed the correlation between demand and supply shocks for the Baltic countries and the Visegrad group, with Germany as a reference. In this case, Hungary was characterized by the highest correlation of aggregate supply shocks and the lowest correlation of the aggregate demand side. Weimann (2002) estimated that Bulgaria, Czech Republic, and Hungary registered the strongest correlation of shocks on the demand side with the Euro area. Frenkel and Nickel (2002) concluded that there are significant differences between the nature, intensity and capacity of the shock adjustment between CEE countries and the Euro area, but some of the new member states there are similarities with economies within the monetary union. According to Babetski (2003), lower correlation of demand and supply shocks monetary union economies should not be a cause for concern because the situation might improve inside the Euro area. Adapting the endogenous hypothesis of an optimum currency area, the economist showed that Euro adopting for some new member states would lead to increase of the intra-industry trade and greater convergence of demand shocks. Arfa (2009) found that several new member countries of the European Union have a quite high correlation of demand shocks with the Euro area however supply shocks are asymmetric. Socol and Soviani (2010), respectively Socol and Măntescu (2011), have explained the weak correlation of the demand shocks due to differences between national fiscal policies.

A short description of the methodology

The decomposition of the demand and supply shocks involves using a structural type of the VAR model, whose restriction are inspired by traditional macroeconomic model with aggregate demand, short-run aggregate supply and long-run aggregate supply. In the short term, an increase in aggregate demand leads to an increase of both production and inflation, so that there will be a direct relationship between these variables. In the long term, a positive demand shock will generate only an increase in prices, while production volume is constant. Increasing short-run aggregate supply leads to economic growth and to inflation rate reducing, so that there will be an inverse relationship between these variables.

In the VAR type models the shocks are a part of a variable that can not be explained by its past values or other variables included in the model. Thus, the term appears as a shock error (residual) from a certain stochastic equation. To identify demand and supply shocks is used a VAR-type model with two variables (GDP and inflation rate) which can be written as in the equations (1) and (2), where each variable is influenced by actual and lagged values of other variables and by its lagged values.

$$y_t = b_{10} - b_{12} \times ir_t + c_{11} \times y_{t-1} + c_{12} \times ir_{t-1} + e_{y,t} \quad (1)$$

$$ir_t = b_{20} - b_{21} \times y_t + c_{21} \times y_{t-1} + c_{22} \times ir_{t-1} + e_{ir,t} \quad (2)$$

Where variables y_t şi ir_t are supposed to be stationary, $e_{y,t}$ şi $e_{ir,t}$ represents the errors with standard deviations σ_y şi σ_{ir}, which are not correlated.

Blanchard and Quah directly associated structural shocks of demand (ε_{dt}) and supply (ε_{st}) with y_t and ir_t variables, as a bivariate moving average. The vector (X_t) composed by the two endogenous variables will be written as an infinite moving average vector of structural shocks, including demand and supply shocks:

$$X_t = C_0 \times \varepsilon_t + C_1 \times \varepsilon_{t-1} + ...C_n \times \varepsilon_{t-n} = \sum_{n=0}^{\infty} L^n C_n \times \varepsilon_t \tag{3}$$

where $\varepsilon_t = \begin{bmatrix} \varepsilon_{dt} \\ \varepsilon_{st} \end{bmatrix}$ and L is a lag operator; $L^0\varepsilon_t = \varepsilon_t$; $L^1\varepsilon_t = \varepsilon_{t-1}$; $L^2\varepsilon_t = \varepsilon_{t-2}$....

The starting point of their model is the following:

$$\begin{bmatrix} \Delta y_t \\ \Delta ir_t \end{bmatrix} = \sum_{i=0}^{\infty} \begin{bmatrix} a_{11i} & a_{12i} \\ a_{21i} & a_{22i} \end{bmatrix} \times \begin{bmatrix} \varepsilon_{dt} \\ \varepsilon_{st} \end{bmatrix} \tag{4}$$

where Δy_t and Δir_t represent, respectively, changes in the logarithm of output and prices at time t, ε_{dt} and ε_{st} represent supply and demand shocks and a_{kji} represent each of the elements of the impulse-response function to shocks.

The model defined by equations (4) also implies that the bivariate endogenous vector can be explained by lagged values of every variable. If A_i represents the value of model coefficients, the model to be estimated is the following:

$$\begin{bmatrix} \Delta y_t \\ \Delta ir_t \end{bmatrix} = A_1 \times \begin{bmatrix} \Delta y_{t-1} \\ \Delta ir_{t-1} \end{bmatrix} + A_2 \times \begin{bmatrix} \Delta y_{t-2} \\ \Delta ir_{t-2} \end{bmatrix} + ... + \begin{bmatrix} e_{yt} \\ e_{irt} \end{bmatrix}, \tag{5}$$

where e_{yt} and e_{irt} are the residuals of every VAR equation. Equation (5) can be also expressed as:

$$\begin{bmatrix} \Delta Y_t \\ \Delta ir_t \end{bmatrix} = (I - A(L))^{-1} \times \begin{bmatrix} e_{yt} \\ e_{irt} \end{bmatrix} = (I + A(L) + A(L)^2 + ...) \times \begin{bmatrix} e_{yt} \\ e_{irt} \end{bmatrix}, \tag{6}$$

and in an equivalent manner:

$$\begin{bmatrix} \Delta Y_t \\ \Delta ir_t \end{bmatrix} = \sum_{i=0}^{\infty} \begin{bmatrix} d_{11i} & d_{12i} \\ d_{21i} & d_{22i} \end{bmatrix} \times \begin{bmatrix} e_{yt} \\ e_{irt} \end{bmatrix} \tag{7}$$

Putting together equations (4) and (7):

$$\sum_{i=0}^{\infty}\begin{bmatrix} d_{11i} & d_{12i} \\ d_{21i} & d_{22i} \end{bmatrix} \times \begin{bmatrix} e_{yt} \\ e_{irt} \end{bmatrix} = \sum_{i=0}^{\infty} L^i \times \begin{bmatrix} a_{11i} & a_{12i} \\ a_{21i} & a_{22i} \end{bmatrix} \times \begin{bmatrix} \varepsilon_{dt} \\ \varepsilon_{st} \end{bmatrix}, \quad (8)$$

Where a matrix, denoted by c, can be found that relates demand and supply shocks with the residuals from the VAR model.

$$\begin{bmatrix} e_{yt} \\ e_{irt} \end{bmatrix} = \left[\sum_{i=0}^{\infty}\begin{bmatrix} d_{11i} & d_{12i} \\ d_{21i} & d_{22i} \end{bmatrix}^{-1} \times \sum_{i=0}^{\infty} L^i \times \begin{bmatrix} a_{11i} & a_{12i} \\ a_{21i} & a_{22i} \end{bmatrix} \right] \times \begin{bmatrix} \varepsilon_{dt} \\ \varepsilon_{st} \end{bmatrix} = c \times \begin{bmatrix} \varepsilon_{dt} \\ \varepsilon_{st} \end{bmatrix}. \quad (9)$$

From equation (9) it results that in the 2x2 considered model, four restrictions are needed to define uniquely the four elements of matrix c. Two of these restrictions are simple normalisations that define the variances of shocks ε_{dt} and ε_{st}. The usual convention in VAR models consists of imposing the two variances equal to one, which together with the assumption of orthogonality define the third restriction $c' \times c = \Sigma$, where Σ is the covariance matrix of the residuals e_y and e_{ir}. The final restriction that permits matrix c to be uniquely defined comes from macroeconomic theory and it refers to cumulative effects of demand shocks on output which must be zero.

Results obtained

In this study I have applied SVAR methodology to identify aggregate demand and supply shocks for 13 economies of the EU and the Euro area. Five of the economies are from Central and Eastern Europe (Romania, Hungary, Czech Republic, Poland, Slovakia), four are peripheral (Portugal, Spain, Greece and Ireland) and others are form the euro area core (Germany, France, Italy and Austria). Motivation for choosing these economies was that of estimating the degree of the shocks correlation within the euro area (between core and periphery) and between several new member states and the Euro area as a whole, respectively some economies that form it. To identify the demand and supply shocks I have used quarterly data series of real GDP and inflation in the period 1998:1 - 2010:3, the total number of observations being 51. Real GDP was expressed as an index with base year 2000, while inflation is the percentage change in GDP deflator. The source of data was Eurostat and to estimate the demand and supply shock I have used EViews software. Because of the influence of seasonality specific to quarterly macroeconomic data, I have applied for all data series of TRAMO/SEATS to eliminate this feature of the variables.

After this process, I have tested the stationary character of both variables expressed in logarithm. These may have a unit root, which would characterize the presence of a trend or lack of stationarity. To investigate this hypothesis, I have used the ADF test, whose H0 hypothesis is the existence of a unit root. For most data series I have estimated the existence of a unit root at level and no root on the first differences. It results that the variables are integrated of order 1, ie I (1). In the table below I have included the probabilities associated with the ADF test for I (0) and for I (1). If the probability is higher than threshold of significance (5%, respectively 1%) then that variable has not stationary.

According to the results of the stationarity test included in Table 1, Ireland is the only economy whose GDP is stationary at the level, evidence of an economy flexible, easily able to neutralize the shocks affecting it. Hungary and Slovakia register also a relatively high level of economic flexibility. In terms of inflation, it is stationary at 1% in Germany and Slovakia, proving the ability of domestic supply side to counteract the influence of aggregate demand shocks. Furthermore, the stationarity at level is a virtue in a monetary union, allowing faster adjustment of economic shocks that generate either a decline in the economy or is overheating it.

Table 1

The ADF test probabilities

Countries	**GDP**		**GDP DEFLATOR**	
	I(0)	**I(1)**	**I(0)**	**I(1)**
	H0: There is a unit root (it's lacking stationarity)			
Romania	0.8544	0.0072	0.5854	0.0000
Euro Area	0.5386	0.0005	0.4605	0.0000
Germany	0.1864	0.0000	0.0042	-
France	0.2034	0.0014	0.2825	0.0001
Italy	0.2028	0.0005	0.7892	0.0000
Austria	0.6111	0.0108	0.8829	0.0001
Spain	0.9863	0.0026	0.1065	0.0001
Portugal	0.1377	0.0000	0.0409	0.0000
Greece	0.2265	0.0000	0.1197	0.0000
Ireland	0.0110	0.0000	0.7982	0.0000
Czech Republic	0.2388	0.0169	0.1823	0.0000
Hungary	0.0871	0.0002	0.0424	0.0000
Poland	0.7708	0.0128	0.1075	0.0000
Slovakia	0.1368	0.0000	0.0028	-

Source: Eurostat (2011); personal estimations with Eviews 7 software.

Since the variables expressed as first differences became stationary, I have built one VAR model consists of real GDP and inflation series for each of the 14 economies. A VAR model is valid if it satisfies the following conditions:

- a good representation of the model, by choosing the optimal number of lags;

- stability, obtained if the roots are lower than unity;
- residual validity by lack of autocorrelation, by normalization and homoskedasticity.

To identify the correct number of lags of the VAR model for economies included in this paper I have used the criteria provided by LR Sequential tests, Akaike Criterion, Schwarz and Hanna-Quinn Criterion tests**.** To validate these tests I have applied the Lag Exclusion Wald Test, whose null hypothesis is rejecting the choice lag. If its probability is below 1% or 5% the optimal lag is selected. According to the results included in the Table 2, it results that eight economies have a VAR with one lag, three have VAR models with two lags and another three are characterized by 3 and 4 lags for the two data sets included the VAR.

Table 2

The estimation of the number of VAR lags

Countries	Sequential LR	AIC	SC	HQ	Chosen lag	Probabilities of Lag exlusion test H0: the statistics χ^2 rejects the selected lag
Romania	4	4	4	4	4	0.000261
Euro Area	1	1	1	1	1	0.000136
Germany	1	1	1	1	1	0.033883
France	2	3	1	2	2	0.039302
Italy	1	1	1	1	1	0.000214
Austria	1	1	1	1	1	0.000796
Spain	4	4	1	4	4	0.003020
Portugal	2	2	2	2	2	0.027871
Greece	3	3	3	3	3	0.027798
Ireland	1	1	1	1	1	0.000000
Czech Republic	1	1	1	1	1	0.000053
Hungary	1	1	1	1	1	0.007902
Poland	2	2	1	2	2	0.009867
Slovakia	1	1	1	1	1	0.000000

Source: Eurostat (2011); personal estimations with Eviews 7 software.

The VAR models of the 14 economies must also fulfill the conditions on the residual validity that supposes the normal distribution, homoskedasticity and lack of errors autocorrelation. In the table below I have included the tests probabilities associated with the three conditions previously mentioned. Because their values are higher than threshold of significance at 5%, then the three null hypothesis are accepted, which validates the correct representation of the VAR models residual.

Table 3

The probabilities of the VAR residual tests

Countries	Autocorrelation LM test	Cholesky (Lutkepohl) Normality test	White Heteroskedasticity test
	H0 no errors correlation for the choice lag	**H0 the residual VAR has a normal distribution**	**H0 no heteroskedasticity**
Romania	0.2815	0.4411	0.3486
Euro Area	0.2105	0.2485	0.2979
Germany	0.3747	0.5948	0.5727
France	0.0693	0.5718	0.1805
Italy	0.4111	0.0706	0.1060
Austria	0.2298	0.1123	0.8939
Spain	0.2030	0.2006	0.4189
Portugal	0.4251	0.6383	0.4246
Greece	0.4105	0.3869	0.2465
Ireland	0.1317	0.2274	0.4941
Czech Republic	0.2282	0.0788	0.2225
Hungary	0.1539	0.0641	0.1830
Poland	0.3507	0.2319	0.8631
Slovakia	0.6900	0.1916	0.2608

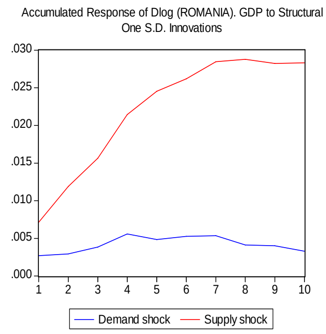
Source: Eurostat (2011); personal estimations with Eviews 7 software.

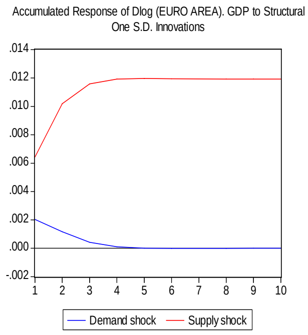
Once I have established the final form of VAR models and have checked their statistical validity, I imposed structural restrictions needed to identify the demand and aggregate supply shocks. To achieve compatibility between the theoretical model (aggregate demand – aggregate supply) and SVAR model, the latter must meet the following conditions:

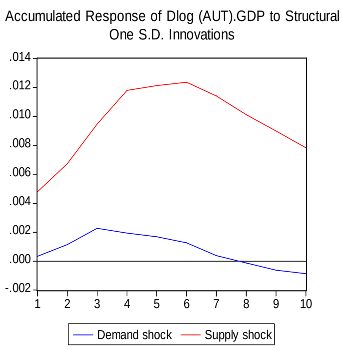
- Aggregate demand shocks on GDP are some temporary, while aggregate supply shocks are some permanently. Therefore, the accumulated response of economic growth rate to aggregate demand shocks should register a neutralization, while the response to aggregate supply shock is permanent. In other words, an aggregate demand shock has only temporary and positive influence on output.
- Positive aggregate supply shocks on inflation induce its increase, while positive shocks of the aggregate supply decreases the rate of inflation.

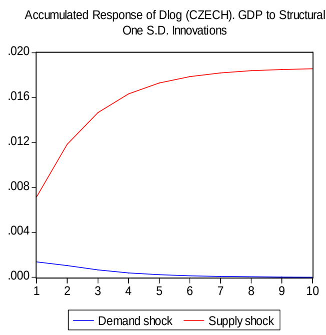
According to Figure 1, the cumulative GDP reaction to demand and supply shocks corresponds to theoretical macroeconomic correlations in all 14 cases. Thus, supply shocks have a rather permanent feature, while demand-side shocks are insignificant in most cases. Both shocks intensity is one point (or unit) standard deviation of relative to the average period. Among the economies included in the analysis, Slovakia recorded the highest GDP in the first quarter of reaction after the event of supply shock, while Greece had the highest long-term growth. Thus, a shock of 1% of the aggregate supply led to increase of real GDP by 0.17% standard deviation in the first quarter in Slovakia and by 0.2% after 10 quarters. In Greece, the increase was about 0.1% on short term and over 0.3% after nine quarters.

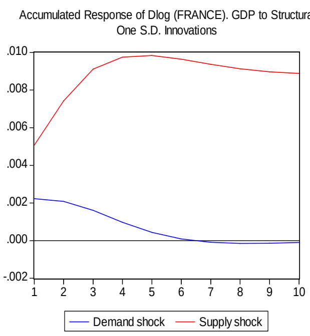
Among the new EU countries, Romania was characterized by largest long-term effect of supply shocks on economic growth (about 0.3% standard deviation). In the case of other new EU member states included in the analysis (Hungary, Czech Republic, Poland), GDP change was at least 0.12% after 10 quarters. Among the countries from the Euro area, Spain has registered a GDP change by about 0.16%, following a positive supply shock with one point standard deviation, while the GDP of Germany, Italy and Ireland have increased by approximately 0.14%. Generally, relatively less developed economies than in Euro area core countries have a greater potential for growth, feature corresponding to decreasing marginal returns hypothesis. The aggregate demand shocks had a temporary feature, so they are neutralized after two quarters in Hungary, three quarters in Slovakia and after five quarters in the Euro area. In Ireland and Italy, demand shocks exert a negligible impact on economic growth. Romania has registered the highest period in which a demand shock is active, it neutralizing after approximately five years.

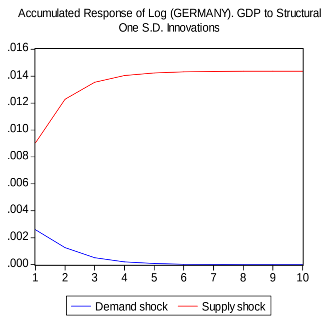


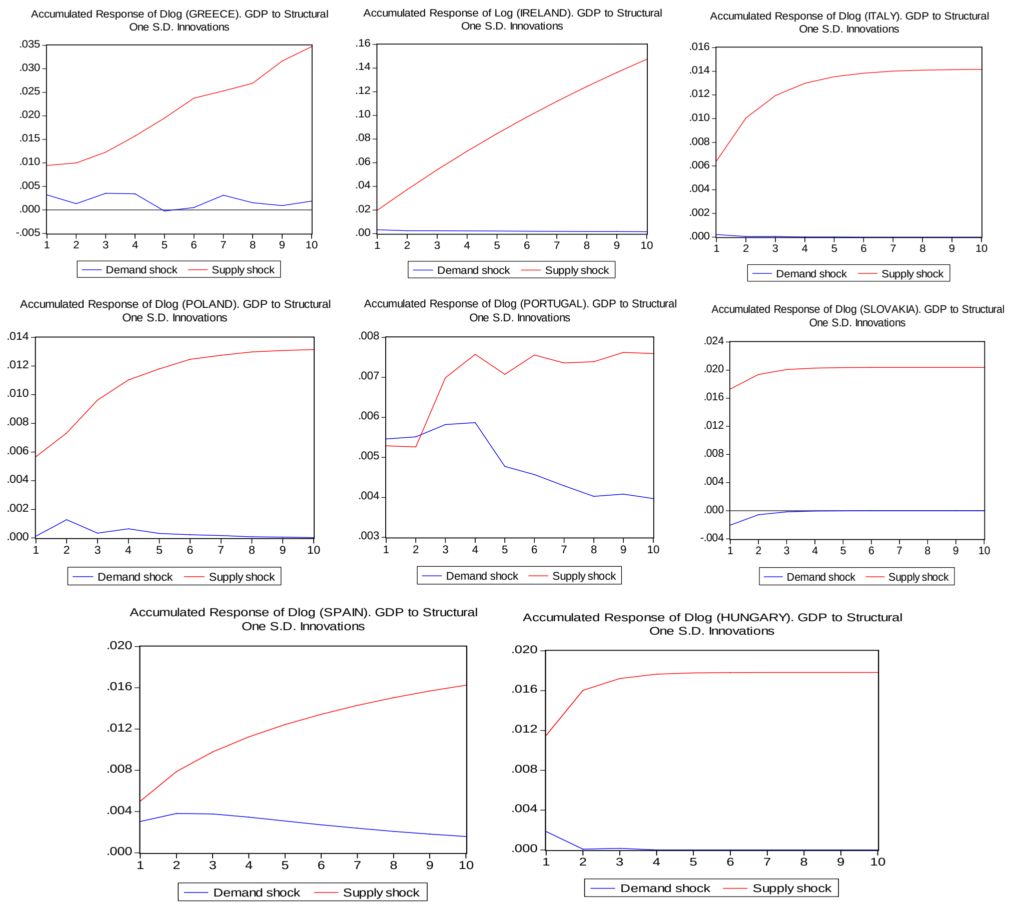








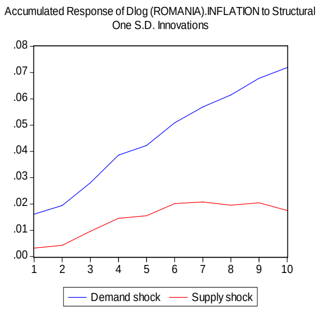




Source: Eurostat (2011); personal estimations with Eviews 7 software.

Figure 1. *Accumulated responses of GDP to demand and supply shocks*

Regarding the inflation response to aggregate supply shocks and demand, theoretical correlations are not observed in four out of 14 cases. In those cases, the inflation rate is not reduced despite positive aggregate supply shocks. Thus, prices of final goods in Romania, Greece, Ireland and Spain can be interpreted as having a high degree of rigidity at reduction, thing that can be attributed to reduced competition, poor economic integration, trade union power, state involvement in the setting of certain internal prices etc. Hungary recorded the highest positive response of inflation to demand shocks, the impact of long-term leveling off at about 0.16 standard deviation points. Concerning the impact on supply growth on inflation, the effects are less significant, tending to remove after about a few quarters, as in the cases of euro area, Austria, France, Hungary, Poland and Slovakia.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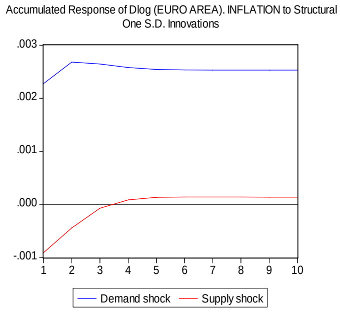
Demand shock
Supply shock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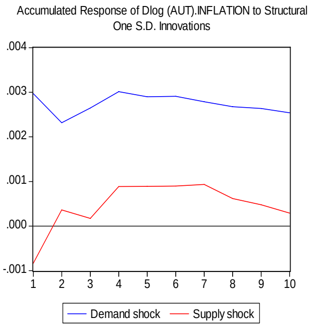
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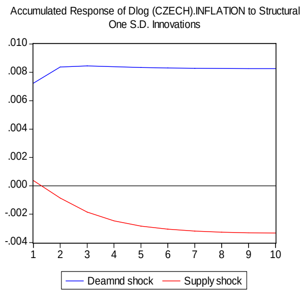
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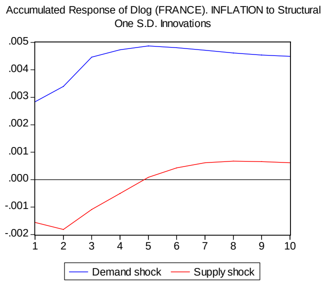
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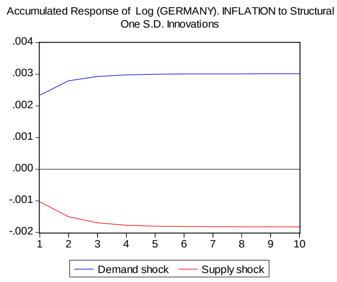
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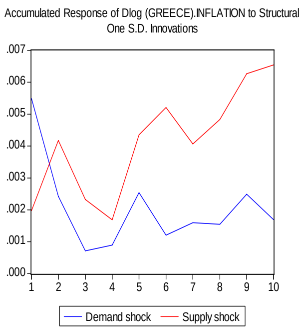
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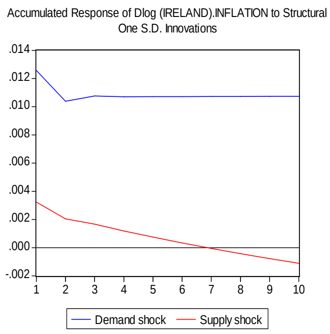
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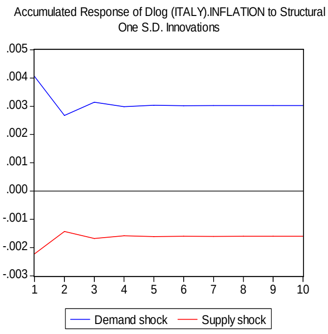
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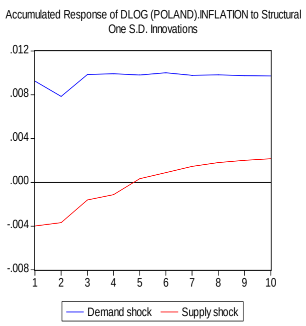
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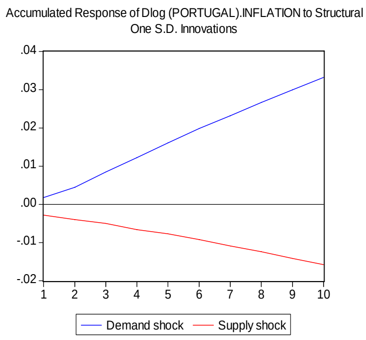
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One S.D. Innovations
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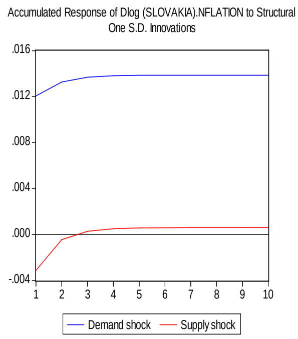
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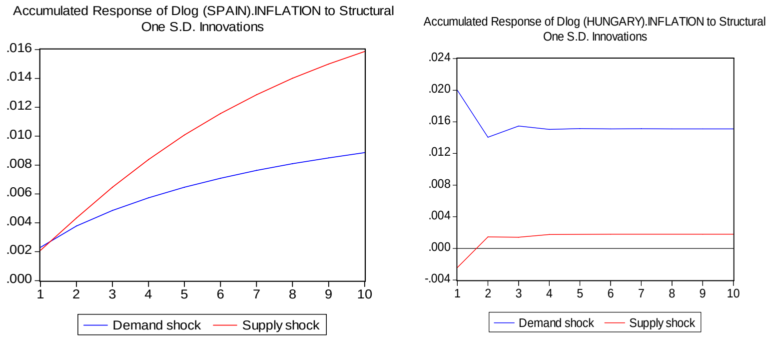


Source: Eurostat (2011); personal estimations with Eviews 7 software.

Figure 2. *Accumulated responses of inflation rate to demand and supply shocks*

It results that this analysis confirmed the importance of supply shocks impact on economic growth and demand for inflation control, supposing that long-term impact of demand on output is neutralizes. To identify the relationship between the intensity of shocks affecting the economies included in this study, we used Pearson correlation coefficient. According to the results obtained and included in tables 4 and 5, joining to the Euro area did not reduce the risk of asymmetric shocks in the event of periphery economies monetary union. The core of it is relatively strongly correlated with the supply side both the whole Euro area, as well as inside it. Among the peripheral countries, Ireland and Portugal had supply and demand shocks positively correlated with the core Euro area, while Spain and Greece have promoted divergent macroeconomic policies in relation to monetary union. For most economies, the correlation of the shocks on the demand side is lower than the supply ones. The weak correlation of demand shocks can be explained by:

- Differences between economic, trade and financial structures of the two economies.
- The existence of different exchange rate regimes and different rates of inflation.
- Differences between stages of development.
- Promoting divergent macroeconomic policies, as a result of different economic developments.

Between the two shocks, those on the aggregate supply side have acquired greater importance in view of accession to the Euro area, because it will decisively influence the convergence between business cycles with Euro area. Those on the aggregate demand side will automatically become more related, in the context of a common monetary policy and a more strictness national fiscal policies.

Table 4

The demand shocks correlation

	RO	EA	GER	FRA	ITA	AUT	SPA	POR	GRE	IRE	CZE	HUN	POL	SLK
RO	1.00													
EA	-0.09	1.00												
GER	-0.08	1.00	1.00											
FRA	-0.09	0.64	0.63	1.00										
ITA	-0.26	0.74	0.74	0.37	1.00									
AUT	-0.05	0.10	0.08	0.02	0.01	1.00								
SPA	-0.04	-0.08	-0.07	-0.11	0.05	-0.11	1.00							
POR	-0.03	0.33	0.29	0.23	0.10	0.38	-0.28	1.00						
GRE	-0.03	-0.05	-0.03	-0.22	-0.01	0.06	0.08	0.08	1.00					
IRE	-0.26	0.42	0.42	0.37	0.13	0.00	0.26	0.09	-0.09	1.00				
CZE	-0.11	0.17	0.18	0.13	0.16	-0.05	-0.14	-0.19	-0.14	0.11	1.00			
HUN	-0.13	0.12	0.13	0.12	0.30	-0.23	0.16	-0.22	0.02	0.05	0.22	1.00		
POL	-0.09	-0.12	-0.12	-0.27	0.10	-0.06	-0.15	0.00	0.19	-0.35	0.21	0.10	1.00	
SLK	0.00	0.14	0.13	0.24	0.27	0.05	-0.12	0.25	0.05	-0.18	0.16	0.34	0.47	1.00

Source: Eurostat (2011); personal estimations with Eviews 7 software.

Among the new EU member states, Czech Republic, Slovakia and Hungary showed a positive correlation of the demand shocks with the Euro area, but weaker as significance, while Poland and Romania had a divergent evolution with the monetary union. Between four of the five CEE economies (except Romania) there was a trend in the same sense of demand shocks. This group of economies has been characterized by a process of structural convergence with EU economies and integration through trade with them, which was reflected in a positive synchronization of the supply shocks with those economies. Hungary, Romania and Slovakia are the most synchronized with the Euro area while the second economy has the most correlated supply shocks with the rest of the economy within the same group.

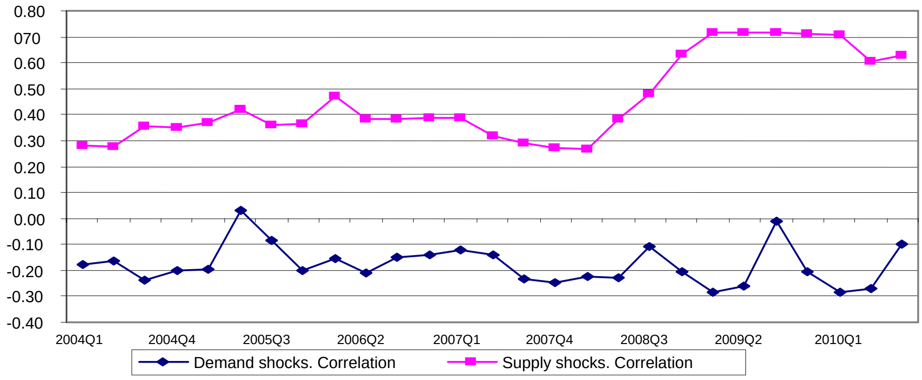
Table 5

The supply shocks correlation

	RO	EA	GER	FRA	ITA	AUT	SPA	POR	GRE	IRE	CZE	HUN	POL	SLK
RO	1.00													
EA	0.54	1.00												
GER	0.55	1.00	1.00											
FRA	0.40	0.75	0.74	1.00										
ITA	0.55	0.78	0.78	0.55	1.00									
AUT	-0.64	-0.57	-0.55	-0.25	-0.53	1.00								
SPA	0.70	0.60	0.61	0.41	0.49	-0.59	1.00							
POR	0.19	0.32	0.33	0.26	0.23	-0.25	0.09	1.00						
GRE	0.23	0.27	0.25	0.28	0.17	-0.09	0.09	0.02	1.00					
IRE	0.40	0.45	0.44	0.43	0.46	-0.32	0.45	0.05	0.15	1.00				
CZE	0.35	0.13	0.15	-0.03	0.10	-0.30	0.16	-0.20	0.05	-0.06	1.00			
HUN	0.51	0.58	0.58	0.51	0.51	-0.50	0.39	0.20	0.50	0.29	0.30	1.00		
POL	0.43	0.10	0.11	0.10	0.16	-0.21	0.17	-0.03	0.18	0.28	0.31	0.13	1.00	
SLK	0.54	0.46	0.46	0.34	0.45	-0.32	0.45	0.11	0.23	0.46	0.06	0.40	0.18	1.00

Source: Eurostat (2011); personal estimations with Eviews 7 software.

To capture the evolution of demand and supply shocks correlation between Romania and the Euro area I have used the five-year rolling-window correlation of five years method. According to this methodology, it appears that there was a weak connection between demand shocks, which is rather contrary in the case of the two economies. The economic crisis has induced a greater divergence of these shocks, the correlation value being about -0.3. The impact of crisis on supply shocks was a different one, generating the transition from weak correlation (lower than 0.3) during 2003-2008, to the average correlation by 0.7 in 2004-2009. Moreover, the correlation of supply shocks higher (approximately 85%) took place between 2007 and 2009. Therefore, the aggregate supply response in Romania has become more similar to the euro area, something which will ensure a higher symmetry of shocks in the future.



Source: Eurostat (2011); personal estimations with Eviews 7 software.

Figure 3. *The correlation of demand and supply shocks between Romania and Euro area (5-year rolling-window correlation)*

Conclusion

The methodology applied in this study is a useful framework to analyse the risks of adopting a common currency, because it allows the identification of the nature of the shocks and more appropriate responses to their action. The basic idea is that aggregate demand shocks affect real GDP only short term, while the impact on inflation is one permanently. The aggregate supply shocks have a permanent influence on the short and long term both on prices and production, the relationship between these being one inverse (increasing the aggregate supply increases production and reduce inflation).

- The cumulative reaction of the GDP to aggregate demand and supply shocks respects the theoretically macroeconomic correlations for all 14 economies analyzed. Thus, supply shocks have a permanent impact, while demand-side shocks are insignificant in most cases.
- Slovakia has the highest reaction of the GDP in the first quarter of the after the event of a supply shock, while Greece had the highest long-term growth.
- Romania was characterized by the largest period when the demand shock is active, neutralizing it after approximately five years.
- Regarding to the inflation response to aggregate supply shocks and demand, theoretical correlations were not observed in four out of 14 cases.
- Prices of final goods in Romania, Greece, Ireland and Spain have a high degree of rigidity to decrease.
- The core of the monetary union is relatively strongly correlated with both the supply side the whole Euro area, as well as inside it. Ireland and Portugal have supply and demand shocks positively correlated with the core Euro area, while Spain and Greece have promoted divergent macroeconomic policies in relation to monetary union.
- For the most economies, the correlation of the demand shocks is lower than the supply ones. Hungary, Romania and Slovakia are the most synchronized CEE economies with the Euro area in terms of supply shocks. The correlation of supply shocks is important for a higher synchronization of business cycles in the Euro area.
- Aggregate supply response in Romania has become more similar to the Euro area, something which will ensure a higher symmetry of shocks in the future.

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References

Arfa, B.N., „Analysis of Shocks Affecting Europe: EMU and some Central and Eastern Acceding Countries", *Panoeconomicus*, No. 1, 2009, pp. 1-15

Babetski, J., „EU Enlargement and Endogeneity of some OCA Criteria: Evidence from the CEECs, Czech National Bank", *Working paper*, No.2, 2004, pp. 5-20

Bayoumi, T., Eichengreen B. (1992). *Shocking Aspects of European Monetary Integration*, in: *Growth and adjustment in the European Monetary Union*, *ed*. Torres Francisco and Francesco Giavazzi, pp. 193-230, New York: Cambridge University

Blanchard, O.J., Quah, D., „The Dynamic effects of Aggregate demand and Supply Disturbances", *American Economic Review*, 79(4), 1989, pp. 655-673

Fidrmuc, J., Korhonen, I., „The Euro goes East. Implications of the 2000-2002 economic slowdown for synchronisation of business cycles between the euro area and CEECs", *BOFIT*, *Discussion Paper*, No. 6, 2003, pp. 313-334

Frenkel, M., Nickel, Ch, „How Symmetric are the Shocks and the Shocks Adjustment Dynamics between the Euro Area and Central and Eastern Europe?", *IMF Working Paper*, 02/222, 2002, pp. 53-74

Ramos, R., Suriach, J., „Shocking Aspects of European Enlargement", *Eastern European Economics*, 42(5), 2004, pp. 36-57

Socol, C., Soviani, R., „Experiences of the Large Fiscal Adjustments in EU. Romania's Case", *Theoretical and Applied Economics*, 12(553), 2010, pp. 21-28

Socol, A.G., Măntescu, D., „Re-modeling the Romanian Fiscal Policy under the Terms of the Economic Crisis", *Theoretical and Applied Economics*, 1(554), 2011, pp. 111-120

Weimann, M., „OCA Theory and EMU Eastern Enlargement – An Empirical Application", *Dresdner Beiträge zur Volkswirtschaftslehre*, no. 7, 2002, Technische Universität Dresden, pp. 5-30

Eurostat database, 2011