Financial Integration and Economic Growth in the European Transition Economies

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Abstract:

Economic crisis affected economic activity in the European transition economies (ETE) with an unprecedented extent that may be compared to an initial shock ETE experienced at the beginning of the transition process in the early 1990s. Deterioration of the overall macroeconomic performance was followed by the various spurious effects leading to the slowdown in the process of convergence toward Western European countries. One of the key aspects of this long-term trend - participation of ETE in the process of international capital flows became affected by the economic crisis too. While the overall benefits from the cross-border capital movements significantly contributed to the high rates of real output growth in ETE (most of the countries from this group became large net debtors in the last two decades) during pre-crisis period, sudden shift in a direction as well as a size of a foreign capital inflows may markedly affect the speed of the recovery process from the economic crisis.

In the paper we observe main trends in the process of an international financial integration in ten ETE since 1995. To estimate effects of foreign capital inflows on the performance of ETE we analyze effects of foreign direct investments, portfolio investments and other investments on the real output development. To meet this objective we estimate vector error correction (VEC) model. We estimate two models (one with data sets for pre-crisis period only and second for the whole period). To identify structural shocks we implement a Cholesky decomposition of innovations. Impulse-response functions are computed to estimate short-run effects of foreign capital inflows on real output. Compared results for both models should help us to assess the effects of economic crisis. Mutual short-run (temporal) effects of foreign capital inflows on the real output are estimated using linear Granger causality test.

Keywords: financial integration, international capital flows, economic growth, vector autoregression, Cholesky decomposition, impulse-response function, Granger causality

JEL Classification: F43, G14, G15, O16

1. Introduction

International financial integration of the European transition economies (ETE) that reflects their ability to participate in the process of the international capital flows is closely related to the process of economic integration and convergence, while it is also conditional to the qualitative changes of main macro and microeconomic indicators. International capital flows determine economic development of countries while they also reflect the ability of countries to participate in the process of international division of labour.

International capital flows represents one of the key aspect of the globalisation process and refers to the continuous relieving the cross-border capital allocation barriers reflecting in huge increase in the common financial interconnections among countries during the last two decades (Arfaoui - Abaoub, 2010). International financial integration as a vehicle for a participation of countries in the process of international division of labour helped to reduce the restrictions that limited the investors' decision making on the national levels. Flows of the capital among countries stimulated by increased investment opportunities, expected profits

and better risk diversification generated many positive, symmetric and multiplicative affects. On the other hand it also increased the exposure of countries to many negative and asynchronous defects that led economists to revaluate the overall effects of financial liberalization and dynamic increase in the international capital flows (Obstfeld, 1998). Following the analysis of the overall effects of the international financial integration (Calderon, 2002) we emphasize not only macroeconomic but also microeconomic effects of the international financial integration. The overall outcome of these effects is significantly determined by the general parameters of the economy. On the other the similar economic environment in certain countries doesn't necessarily guarantee the similarity of the effects resulting from the participation of countries in the process of international capital flows (Stulz, 1999).

Specific attention should be taken into the evaluation of the overall effects and outcomes of the international capital flows in ETE. International financial integration of ETE became the most significant outcome of capital flows liberalization process that the past central planning economies have started since the second half of the 1990s. At this time the Eastern European countries were in the specific situation followed soon by a dynamic period of a complicated and capital demanding process of the transition toward the Western European market economies. The decision to allow the cross-border allocation of capital assets and liabilities resulted from the ability of the transition countries to sustain negative balance of payments and exchange rate pressures. Initial low domestic capital base together with usually higher domestic interest rates stimulated significant foreign capital inflows to such a degree that many ETE rapidly became net international capital debtors (Lane - Milesi-Ferretti, 2006).

Macroeconomic stabilisation and expectations of the fast economic convergence of ETE toward the old EU member countries increased an attractiveness of ETE for the foreign investors that resulted in increased foreign direct investments (FDI) inflows to ETE (Stiglitz, 2000). While the effects of the FDI are well described in the present literature, the role of the portfolio investments is typically underestimated. It is typically the result of the low developed domestic financial markets in ETE (Buiter - Taci, 2003). In addition to this obvious trend, changes in the external capital portfolio structure reflected the progress in the domestic economic and institutional reforms, increasing the reliance of foreign investors to allocate more direct and portfolio equity investments in those countries. In comparison with the old EU member countries the effects of the international capital flows in ETE doesn't necessarily followed the generally expected intensity, while the overall outcome can be distorted or even opposite (Edison et al., 2001).

Economic crisis affected economic activity in ETE with an unprecedented extent that may be compared to an initial shock ETE experienced at the beginning of the transition process in the early 1990s. Deterioration of the overall macroeconomic performance was followed by the various spurious effects leading to the slowdown in the process of convergence toward Western European countries. One of the key aspects of this long-term trend - participation of ETE in the process of international capital flows became affected by the economic crisis too. While the overall benefits from the cross-border capital movements significantly contributed to the high rates of real output growth in ETE (most of the countries from this group became large net debtors in the last two decades) during pre-crisis period, sudden shift in a direction as well as a size of a foreign capital inflows may markedly affect the speed of the recovery process from the economic crisis.

In the paper we observe main trends in the process of an international financial integration in ten ETE since 1995. To estimate effects of foreign capital inflows on the performance of ETE we analyze effects of FDI, portfolio investments and other investments on the real output development. To meet this objective we estimate vector error correction

(VEC) model. We estimate two models (one with data sets for pre-crisis period only (2000-2007) and second for the whole period (2000-2010)). To identify structural shocks we implement a Cholesky decomposition of innovations. Impulse-response functions are computed to estimate short-run effects of foreign capital inflows on real output. Comparing results for both models should help us to assess the effects of economic crisis. Mutual short-run effects of foreign capital inflows on the real output are estimated using linear Granger causality test.

2. Overview of Trends in the International Financial Integration of the European Transition Economies

Individual national conditions significantly determine not only height, but also a structure of the international capital flows in which the country participate. Another specific determinant of effects related to the cross-border capital allocation in ETE is the length of the period for evaluation of net effects reflecting the qualitative changes of the main parameters of the economies (Buiter - Taci, 2003). This key factor significantly determined the character (increased share of the equity forms of the capital flows through the time), intensity (increased dynamics of the capital flows on the annual base) as well as the overall effects of the international financial integration of ETE.

Among the other significant aspects that became at least as important as continuously increasing international financial integration we emphasize the progress in the financial sector development and the financial deepening in ETE (Buiter - Taci, 2003). Of course, institutional aspects, heritage from the central planning period and transitional rigidities has significantly affected the overall progress as well as durability of partial steps shaping the individual features of the financial sector development and the financial deepening in each particular country. Hence we assume the financial sector development in ETE became even more complicated and country specific when comparing with the financial integration process.

As of empirical knowledge from the old EU member countries we may expect an overall economic performance of ETE (traditional target of the foreign capital inflows) stimulates crucial changes in the height, structure, as well as the direction of the capital flows over time (Pradhan, 2010). These changes should affect a balance of payments development in ETE. An increase in the export of goods efficiency, an increase in the FDI outflows, a decrease in the foreign indebtedness are only few examples of effects resulting from the expected changes in the role of the more developed ETE in the process of the international capital flows (Stiglitz, 2000).

Another important impact on the height and structure of the international capital flows in ETE that still remains difficult to estimate results from the economic and public debt crisis. An increased uncertainty, higher risk margins, clever credit policy of the commercial banks, decreased domestic and foreign demand, downward pressures on the price indexes, a discriminating state assistance provided to the selected branches of national economies, together with other effects of public debt crisis resulted in reduction of weights for traditional determinants of the international capital flows (not only) in ETE.

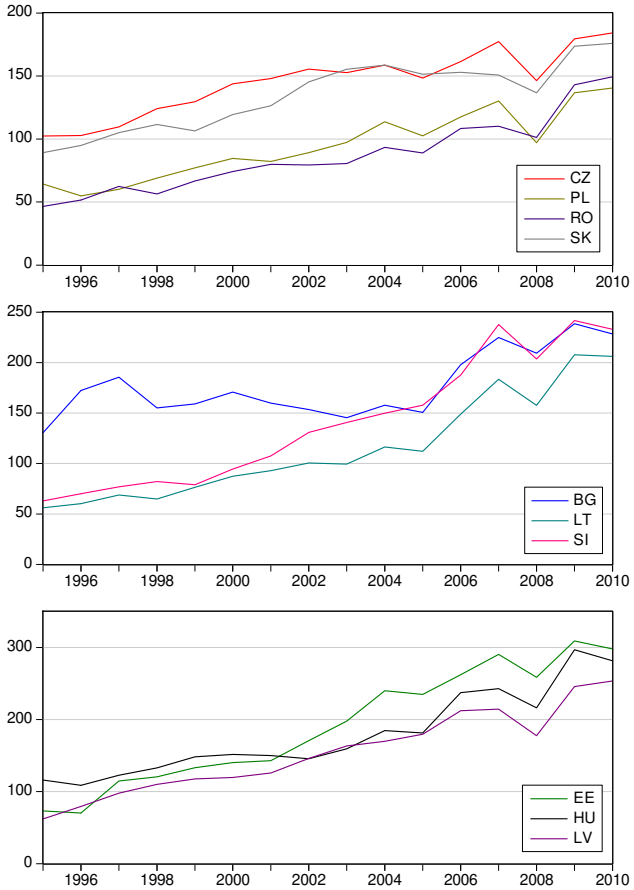
Macroeconomic stabilization followed by the initial shock from the transition to market based economic environment became one of the most challenging objectives for the countries from the Eastern bloc. International competition together with an increasing trade and a financial openness of ETE has fully uncovered their role in the foreign markets (net debtors). Internal structural changes conditionally related to the international competitiveness of the transition countries have generally stimulated the pressure on the sources of domestic capital base formation. It is necessary to emphasize two logical implications of dynamic foreign capital inflows for the transition countries.

Firstly, as a burden of the foreign investments and a debt service (reflecting higher principal repayments) increases over time, borrowing country should endeavor to stabilize its external financial position via trade surpluses. The height of trade surpluses required to stabilize external position depends not only on the volume of accumulated stocks of external capital and the rate of the economic growth but also on the expected rates of return on a country's foreign assets and liabilities, which will be influenced by the composition of the foreign capital inflows and outflows.

Secondly, an indebted economy that faces the strong inflows of the foreign capital should assess its vulnerability to financial shocks. For example, international financial crisis of the 1990s highlighted potential macroeconomic volatility related to the heavy reliance on certain types of external finance, especially short-term foreign-currency debt capital. From this point of view it is important to observe the overall risk included in the different types of country's external financial liabilities.

Capital flows liberalization together with the macroeconomic stabilization were the first and the most crucial assumptions for the increasing international financial integration of ETE. At the same time it is important to emphasize that restrictions on the international financial transactions were not removed by the governments immediately. As a result slow progress in the international capital flows liberalization significantly determined initial structure of the foreign capital inflows to ETE (Edison at al., 2002).

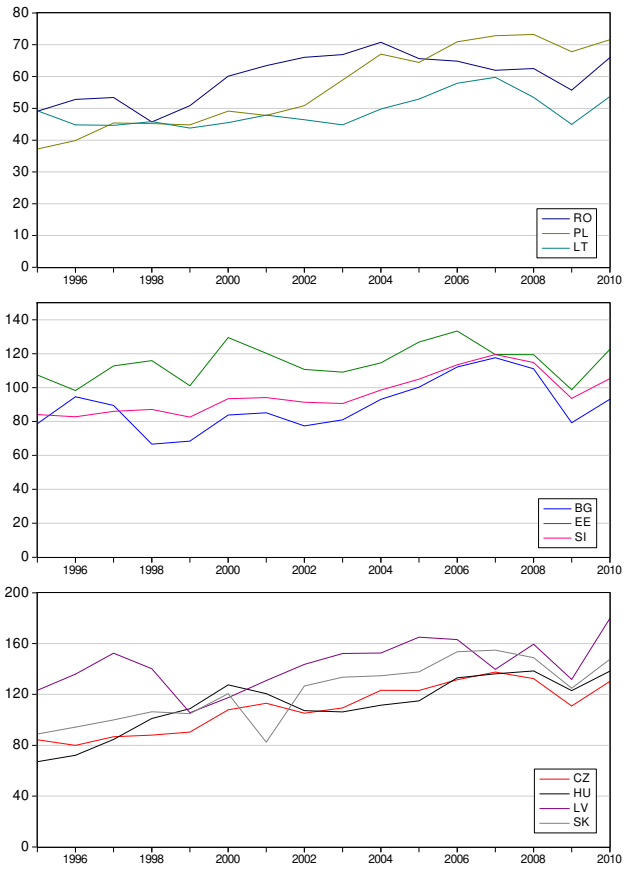
Figure 1 International Financial Integration, 1995-2010



Note: International financial integration - share of international financial assets and liabilities to GDP - (financial assets + financial liabilities)/GDP (in %).
Source: Compiled by author based on data from IMF - International Financial Statistics (November 2011).

Capital flows liberalization is one of the main determinants that formed the development of the external financial openness of ETE at the beginning of the transition process. The crucial changes in the external economic relations of ETE toward the Western European economies soon forced countries from the Eastern bloc into the well expected position of the net foreign borrowers, as it resulted from massive foreign capital inflows. The process of the domestic capital base (especially of a real capital base) reproduction emphasized a disequilibrium between internal financial resources (savings) and real demand for capital investments in the first half of the 1990s. The transition process was heavily dependent on the availability of sufficient stock of capital that together with the high potential of an expected economic growth stimulated inflows of the foreign capital. Among the other determinants that attracted the foreign investors to allocate capital (in the different forms as it will be discussed later) in the transition countries we can also emphasise the role of a skilled labor force (working capital) and the institutional guarantee of the further European Union accession of those countries. While the overall economic performance at the beginning of the transition period was still significantly affected by the initial economic shock, the real economic growth rates in the selected transition economies were surprisingly high during almost whole pre-crisis period.

Figure 2 International Trade Integration, 1995-2010



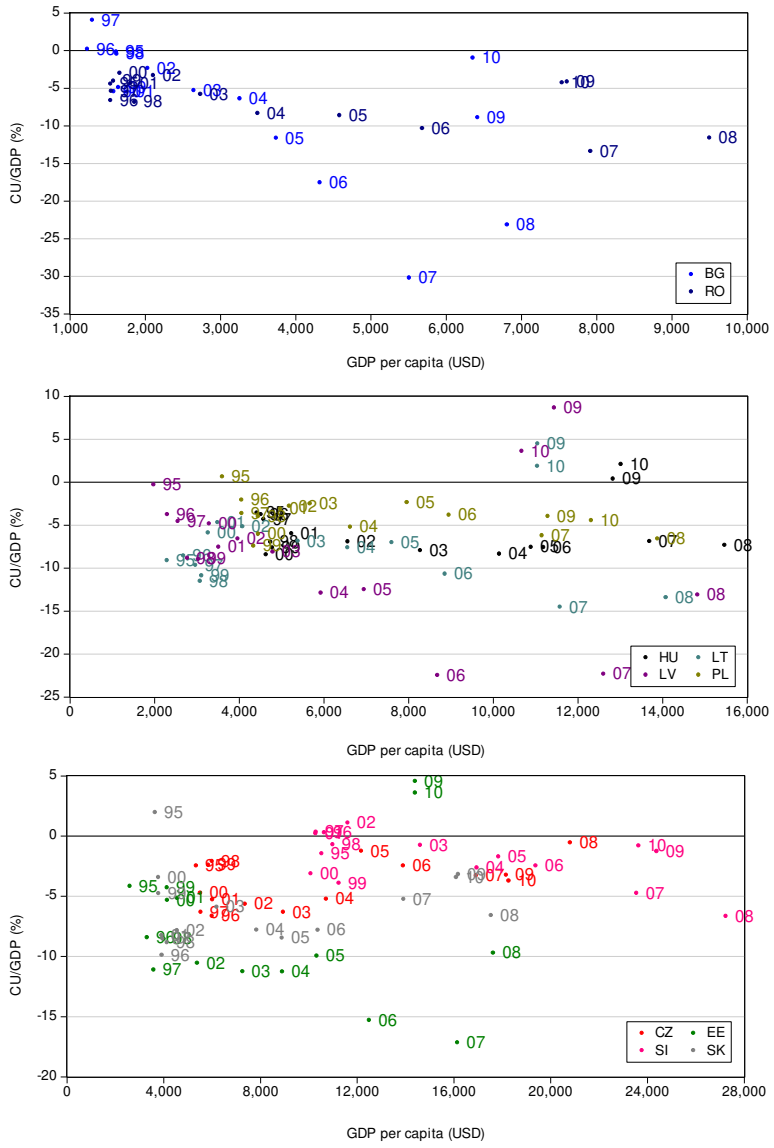
Note: International trade integration - share of a total turnover of foreign trade to GDP - (export + import)/GDP (in %).
Source: Compiled by author based on data from IMF - International Financial Statistics (November 2011).

Figure 1 explores the overall development of the international financial integration (as a measure of a share of financial assets and financial liabilities in the GDP it reflects the overall financial openness of the economy) in ETE. All countries, except Bulgaria, have experienced

the long trend of an increasing share of the foreign financial assets and foreign financial liabilities in the GDP through the most of the period 1995-2010. A rising trend in "external financial depth" development was obvious in spite of the high rates of economic growth that all countries experienced since 2001. As of the end of the period, while the largest economies - Poland and Romania - seem to be the least opened, small economies - Estonia and Latvia tend to be the most opened among all ETE.

Economic crises markedly affected overall development of the external financial openness of ETE. Despite a sharp slowdown in the real GDP growth rates (all countries even experienced a drop in real GDP development for few months in 2009) a share of financial assets and financial liabilities in GDP declined at the end of 2008 in all ten ETE.

Figure 3 GDP per capita and Current Account, 1995-2010



Source: Compiled by author based on data taken from IMF - International Financial Statistics (November 2011).

Figure 2 explores the overall development of the international trade integration in ETE. In contrast with the international financial integration a raising trend in the international trade integration seems to be much slower. This finding corresponds with a general expectation of

much more intensive participation of ETE in the process of cross border capital movements in contrast with the international division of labor. Even thought the international trade integration of less opened economies (Lithuania, Poland and Romania) doesn't fall behind their international financial integration at all, the situation seems to be quite different in case of the most opened economies (Czech republic, Latvia and the Slovak republic).

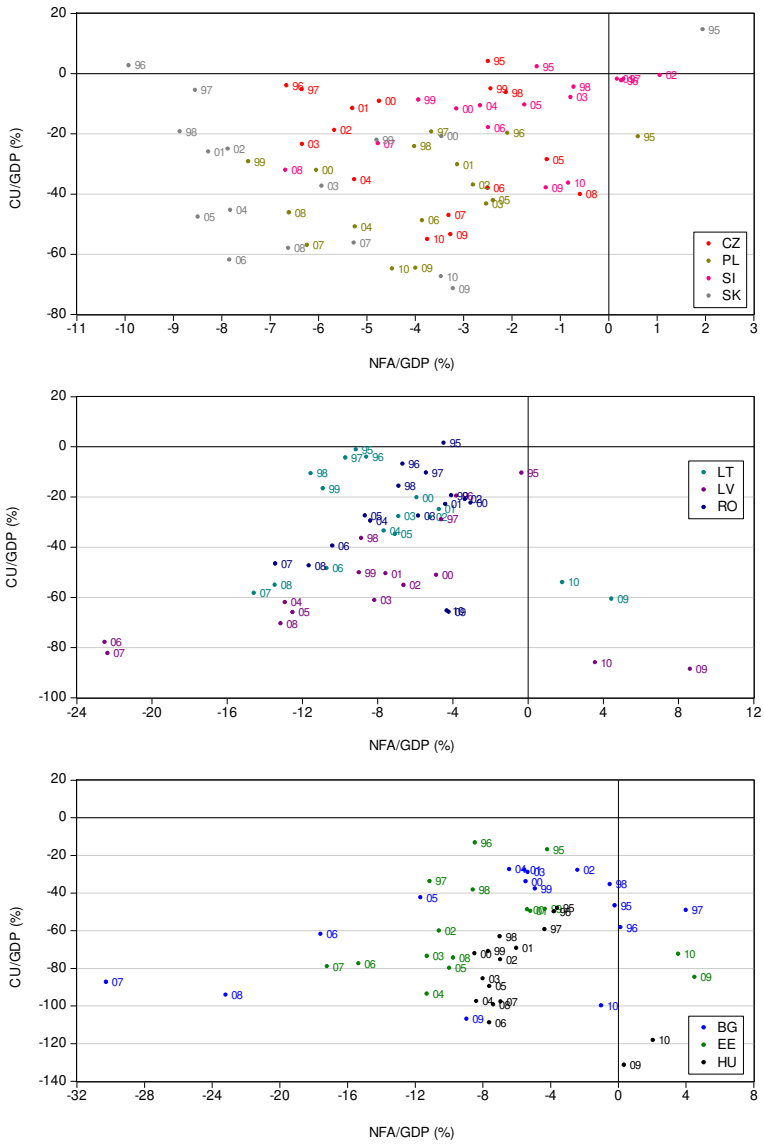
Economic crisis affected the size of a total trade openness of ETE with around nine months lag in comparison with the external financial openness. At the same time we emphasize the international financial integration and the international trade integration represent two simultaneous processes stimulated by the relatively different determinants while reflecting an increase in the overall openness of the national economy. Distortionary effects of the economic crisis thus escalated a disproportion between real and financial flows.

Figure 3 reveals implications of the international trade integration considering a macroeconomic performance of individual ETE. It seems that there is no clear interconnection between one of the main external equilibrium indicator and real GDP per capita. On the other hand all ETE experienced current account deficits during the most of period. While during the first decade of the transition process ETE experienced current account deficits especially as a result of overall low export efficiency at the later stage (especially after the year 2000) we may observe some improvements reflecting an increase in their international competitiveness in the process of convergence toward the Western European countries. At the same time most of countries challenged a trend of a nominal exchange rate appreciation as well as a decrease in price and costs competitiveness. High rates of the real economic growth most of ETE experienced at the end of the pre-crisis period prevented them to sustainable reduce a current account imbalance.

Economic crisis and its negative effects on aggregate demand significantly contributed to the reduction in the current account deficits in ETE.

Net international investment position in the selected group of the countries partially reflects the trends in the current account development (Figure 4). While the differences in the international financial integration among individual countries from the group of ETE seem to be quite different during the pre-crisis period we may observe a negative trend in the net foreign assets development in all countries. As attractive target countries ETE became very attractive destination for foreign investors. As a result foreign liabilities of ETE significantly rose over the last two decades. At the same time the share of foreign assets on GDP lagged markedly. While FDI inflows helped countries to raise an international competitiveness of their production on the foreign markets and thus helped to improve a current account imbalance, among the most important challenges for all four countries we consider their ability to decrease the share of debt capital inflows and to stimulate FDI of domestic private enterprises abroad.

Figure 4 Net International Trade and Net Investment position, 1995-2007

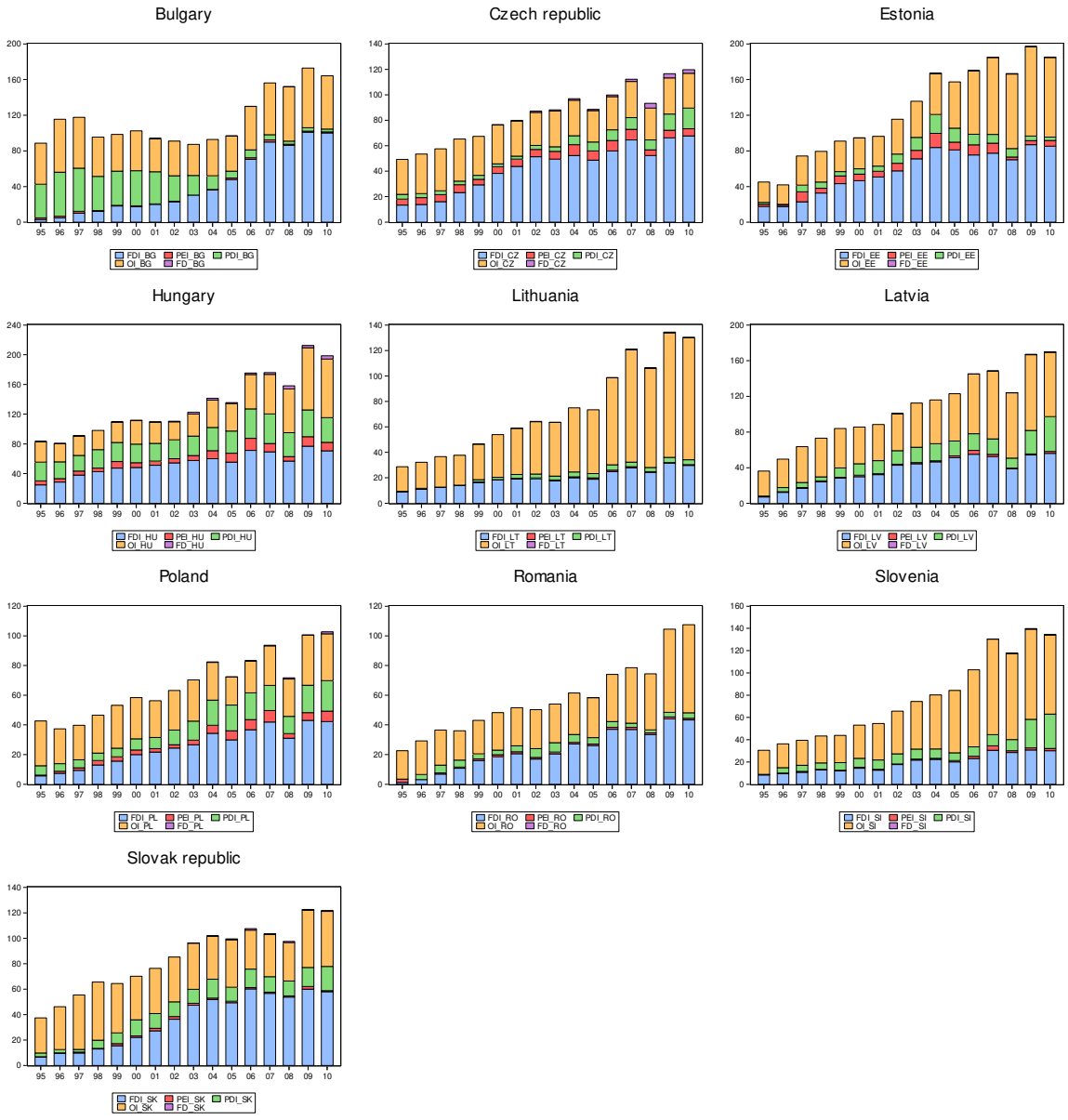


Source: Compiled by author based on data taken from IMF - International Financial Statistics (November 2011).

In order to analyze country specific features of the international financial integration in ETE we observe a detailed structure of the external capital portfolio in the period 1995-2010 (Figure 5). In spite of the relatively different net international investment position of each individual country it is useful to identify trends in the external liabilities portfolio in the whole group of countries. The relative importance of FDI inflows was increasing during the whole pre-crisis period indicating a rising interest of foreign investors to allocate the real investments in profitable domestic industries. This trend is the most obvious since 2002. Gradually increasing and relatively high share of the FDI in the foreign financial liabilities brings few interesting implications. First, the FDI enables domestic companies to share the business and investment risk with the foreign investor. The FDI returns for the foreign investor are not fixed but determined by the overall profitability of the capital allocated in the target economy. The risk transfer from the domestic to foreign investors enables target economies to sustain relatively high current account deficits that on the other hand stimulate the process of the convergence toward the Western European economies. Second, the inflows

of the FDI to the selected group of countries stimulated the transfer of the new technologies that contributed to higher overall productivity and national income growth. On the other hand we suppose that significant part of the profits from the projects financed by the FDI flows back to the foreign investors domicile.

Figure 5 External Financial Liabilities Portfolio Structure, 1995-2010



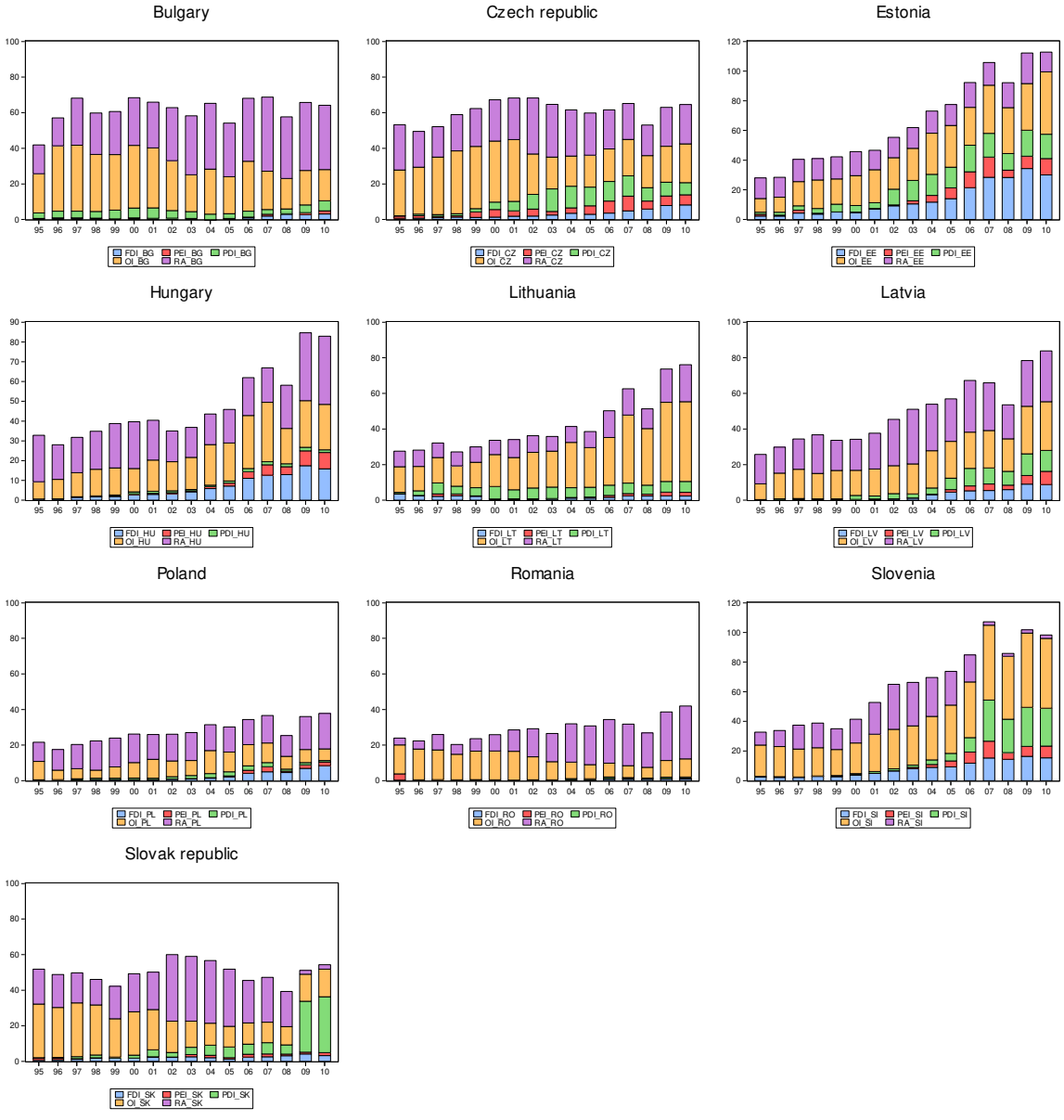
Note: foreign direct investments (FDI), portfolio equity investments (PEI), portfolio debt investments (PDI), other investments (OI) and financial derivatives (FD) are expressed as a percentage share of GDP.
Source: Compiled by author based on data taken from IMF - International Financial Statistics (November 2011).

On the other hand it is clear that the higher economic performance of the country (measured by the GDP per capita) is associated with the lower debt capital inflows. At the same time the share of portfolio (debt and capital) capital inflows is really low in all countries suggesting the relatively insufficient level and the low absorption capacity of the domestic capital markets. The share of the portfolio investments in the total foreign financial liabilities in the selected group of countries remains rather low in spite of the generally expected convergence of the foreign financial liabilities structure toward the Western European

countries. Due to the persisting international financial integration and the domestic financial markets deepening as well as increasing quality of the corporate governance we expect an increase in the weight of the foreign portfolio equity and portfolio debt investments in the selected transition economies. The share of other (especially debt) investments didn't follow a common trend in ETE. In the structure of debt investments dominated long-term debt securities.

While the structure of the foreign liabilities portfolio seems to be crucial considering the negative development of the net international investment position of the selected transition economies resulting from the intensive foreign capital inflows during the whole period it is still important to observe the structure of the foreign assets portfolio to analyze the ability of ETE to allocate the domestic capital abroad.

Figure 6 External Financial Assets Portfolio Structure, 1999-2007



Note: foreign direct investments (FDI), portfolio equity investments (PEI), portfolio debt investments (PDI), other investments (OI) and reserve assets (RA) are expressed as a percentage share of GDP.
Source: Compiled by author based on data taken from IMF - International Financial Statistics (November 2011).

From the detailed structure of the foreign assets portfolio (Figure 6) we observed the dominant share of the central banks' reserve assets in almost all ETE. The situation is quite different especially when we compare a foreign assets portfolio in ETE with the Western European countries (a share of reserve assets usually does not exceed 5 percent especially due to a loss of a monetary sovereignty after the entry to EMU). As the main reason of such a trend we recognized a relatively high importance of the reserve assets for the national central banks (foreign exchange market interventions, smoothing the balance of payments imbalances). Another essential feature resulting from the foreign assets portfolio structure in ETE is the negligible role of the equity investments (FDI and portfolio equity investments) in almost all countries (with few exceptions especially in last few years) reflecting relatively low involvement of domestic investors on the foreign capital markets. We assume it restrain domestic investors to get full advantages of the risk sharing with foreign partners. Relatively high share of the debt investments (credits) represents almost completely activities of the domestic commercial banks.

3. Econometric model

In order to analyze the effects of foreign capital inflows on the economic growth in ten ETE we estimate a vector error correction model. The paper implements a multivariate cointegration methodology introduced by Johansen (1988, 1991) and Johansen and Juselius (1990) to estimate the relationships between different types of foreign capital inflows and real output in the selected group of countries. Johansen method is applied to the unrestricted vector autoregression (VAR) model that can be written by the following moving average representation of *n* non-stationary variables containing *p* lagged values:

$$Y_t = \mu + A_1 Y_{t-1} + A_2 Y_{t-2} + \ldots + A_p Y_{t-p} + \varepsilon_t \tag{1}$$

where Y_t $\left(Y_t = \left[ci_t, y_t, p_t, i_t, er_{n,t}\right]\right)$ is a $n\ x\ 1$ vector of the contemporaneous endogenous variables (ci_t - foreign capital inflows, $y_{r,t}$ - real output, p_t - inflation, i_t - interest rate, $er_{n,t}$ - exchange rate), μ is a $n\ x\ 1$ vector of the constants, A_i are $n\ x\ n$ polynomial variance-covariance matrix, $\varepsilon_t \sim N_n\left(0, \sum_\varepsilon\right)$ is a $n\ x\ 1$ normalized vector of exogenous shocks (innovations) to the model representing unexplained changes in the variables.

If at least two of the variables are cointegrated of the order one (I(1)) the VAR representation in the equation (1) can be rewritten by subtracting Y_{t-1} to the following vector error correction model (VECM):

$$\Delta Y_t = \mu + \Pi Y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta Y_{t-i} + \varepsilon_t \tag{2}$$

where ΔY_t is a $n\ x\ 1$ vector of the first differences of stochastic variables Y_t, $\Pi = \sum_{i=1}^{p} A_i - I$, $\Gamma_i = -\sum_{j=i+1}^{p} A_j$, I is $n\ x\ n$ identity matrix.

Presented VECM contains information on both short-term and long-term adjustments to changes in Y_t included in estimated Γ and Π respectively. Γ is a $n\ x\ n$ matrix that represents the short-term dynamic - adjustments to changes in Y_t. Π is a $n\ x\ n$ matrix consisting of the

long-run coefficients - the cointegrating relationships (cointegrating vectors) and of the error correction term. Π can be decomposed as follows:

$$\Pi = \alpha\beta' \tag{3}$$

where α represents $n\ x\ r$ a loading matrix containing coefficients that describe the contribution of the *r* long-term (cointegrating) relationships in the individual equations and denotes the speed of adjustment from disequilibrium, while β is a $n\ x\ r$ matrix of long-run coefficients and represents the *r* linearly independent cointegrating vectors (each column of β is the cointegrating vector). The number of cointegrating relations among variables of Y_t is the same as the rank (*r*) for the matrix Π. If it has a full rank, the rank $r = n$ and it means there are *n* cointegrating relationships and that all variables are I(0). If a vector Y_t is a vector of endogenous variables that are I(1), then all terms in equation (2) are I(0), and ΠY_{t-1} must be also stationary for $\varepsilon_n \sim \mathrm{I}(0)$ to be white noise. If the matrix Π has reduced rank, $r < n$, there are $n-1$ cointegrating vectors and even if all endogenous variables in the model are I(1), the level-based long-run component would be stationary. VECM requires there exists at least one cointegrating relationship.

In order to find a presence of cointegrating (long-run) relationships, we use the trace test and maximum eigenvalue test. Determination of rank and estimation of the coefficients are computed as maximum likelihood estimation. The corresponding likelihood-ratio test statistics are:

$$\lambda_{trace}(r) = -T\sum_{i-r+1}^{n}\ln\left(1-\hat{\lambda}_i\right) \qquad \lambda_{\max}\left(r, r+1\right) = -T\ln\left(1-\hat{\lambda}_{r+1}\right) \tag{4}$$

where *r* is the number of cointegrating vectors under the null hypothesis and $\hat{\lambda}$ is the estimated value for the *ith* ordered eigenvalue from the Π matrix. Under the trace statistic, the null hypothesis that the number of cointegrating vectors is less than or equal to *r* is tested against the alternative that there are more than *r* vectors. Whereas under the maximum eigenvalue test the null hypothesis that there are *r* cointegrating vectors is tested against the alternative of $r+1$ cointegrating vectors.

Once we estimate VECM, the short-run relationships can be calculated implementing impulse-response functions (IRF). IRF shows the response of each variable in the system to the shock in any of the other variables. In order to calculate the IRF it is necessary to apply a transformation matrix, B, to the innovations so that they become uncorrelated. The IRF would be calculated from the following moving average representation of the VECM:

$$Y_t = \sum_{i=0}^{\infty} B_i\varepsilon_{t-i} \qquad\qquad t = 1, 2, ..., T \tag{5}$$

where *T* is a number of usable observations and $n\ x\ n$ coefficient matrices $B_i\left(i = 2, ..., p\right)$ are recursively calculated using the following expression:

$$B_i = \Phi_1 B_{i-1} + \Phi_2 B_{i-2} + ... + \Phi_p B_{i-p} \tag{6}$$

with $B_0 = I_n$; $B_i = 0$ for $i < 0$; $\Phi_1 = I + \Pi + \Gamma_1$, $\Phi_i = \Gamma_i - \Gamma_{i-1}$ $\left(i = 2, ..., n\right)$.

The Cholesky method uses the inverse of the Cholesky factor of the residual covariance matrix in order to orthogonalize the impulses. This method imposes an ordering of the variables and attributes all of the effect of any common component to the variable that comes first in the system. Responses can change if the ordering of the variables change.

Before estimating the model we have to test the time series for stationarity. Due to Engle and Granger (1987) it is necessary that all variables within the cointegration relationship must have the same order of integration. In addition, the time series should not be I(0), since this will lead to trivial cointegrating vectors.

We also test the direction of the causality relationships between different types of foreign capital inflows and real output using linear Granger causality test defined by the following expression:

x_t is said to does not Granger-cause y_t, if

$$E\left(y_{t+p}\left|\Omega_t\right.\right) = E\left(y_{t+p}\left|\Omega_t - x_t\right.\right) \qquad (\forall p > 0) \tag{7}$$

where x_t and y_t are two times series, Ω_t is all the information available at time T and $(A|B)$ is the conditional distribution of A given B.

The expression (7) can be also explained as follows: x_t is said to not Granger-cause y_t if cannot help predict future *y*.

To meet the objective of the paper to estimate effects of foreign capital inflows on the macroeconomic performance of ETE we analyze effects of FDI, portfolio investments and other investments on the real output development. We estimate two models (first model - model A with data sets for pre-crisis period only (2000-2007) and second model - model B for the whole period (2000-2010) for each country from a group of ETE while we also substitute first variable (foreign capital inflows) by inflows of foreign direct investments (FDI), portfolio investments (PI) and debt investments (DI):

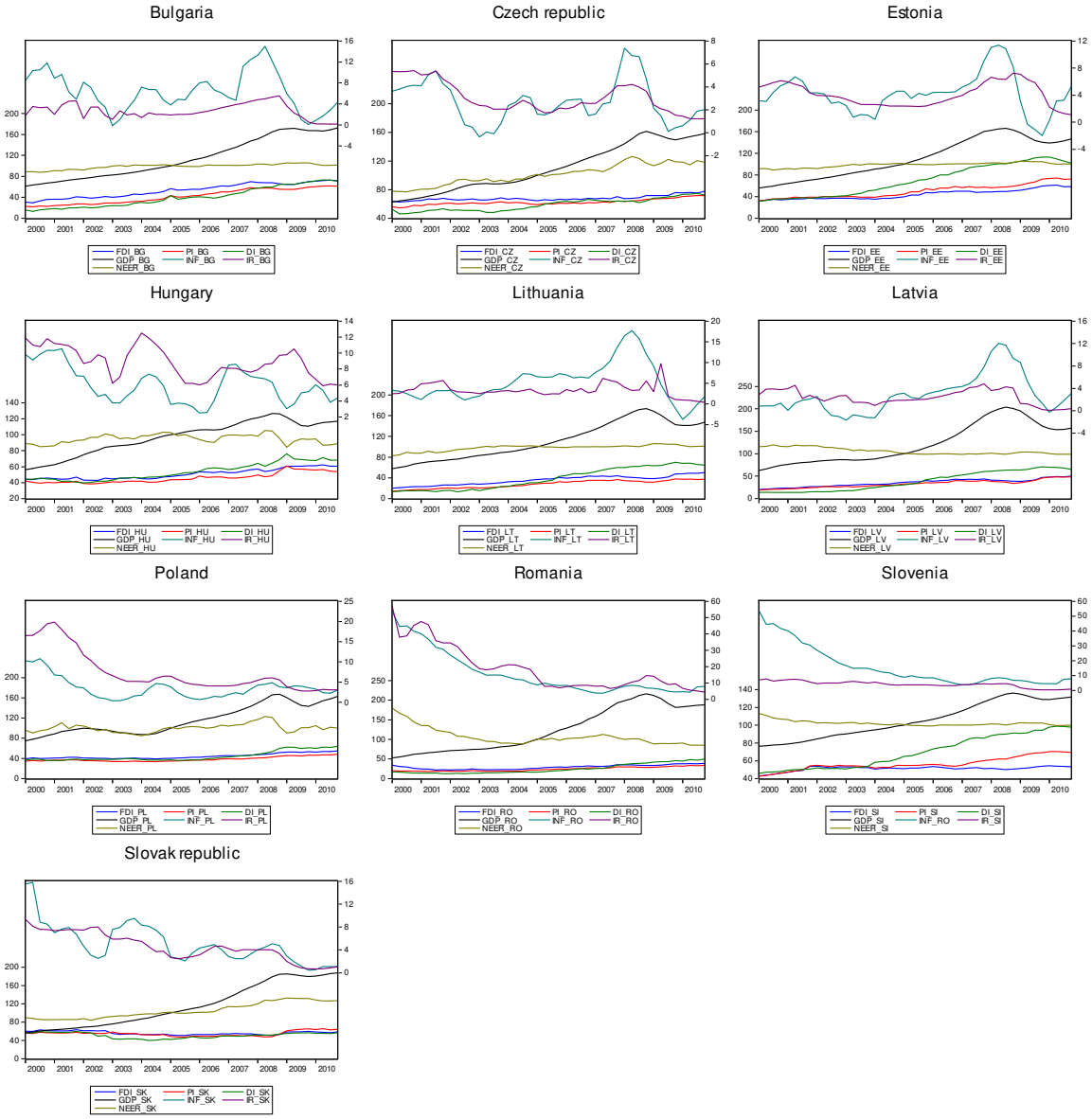
- model A1, B1 $\left(Y_t = \left[fdi_t, y_t, p_t, i_t, er_{n,t}\right]\right)$
- model A2, B2 $\left(Y_t = \left[pi_t, y_t, p_t, i_t, er_{n,t}\right]\right)$
- model A3, B3 $\left(Y_t = \left[di_t, y_t, p_t, i_t, er_{n,t}\right]\right)$

Using the estimated VEC model, the dynamic responses of the real output to the main types of foreign capital inflows (foreign direct investments, portfolio investments and debt investments) one standard deviation shocks are computed for each country from the group of ETE.

4. Data and results

We use the quarterly data ranging from 2000Q1 to 2010Q4 (44 observations) for foreign direct investments, portfolio investments, debt investments, real output, short term interest rates and nominal effective exchange rates (Figure 7).

Figure 7 Endogenous variables



Note: Endogenous variables - foreign direct investments (FDI), portfolio investments (PI), other investments (OI), gross domestic product (GDP), nominal effective exchange rate (NEER) are expressed as index (left axis in the graph) (2005 = 100). Inflation (INF) and interest rates (IR) are expressed as in percentage (right axis in the graph).
Source: Compiled by author based on data taken from IMF - International Financial Statistics (November 2011).

A. Unit Root Test

Before estimating the model we test the time series for stationarity and cointegration. The augmented Dickey-Fuller (ADF) and the Phillips-Perron (PP) tests were computed to test the endogenous variables for the existence of the unit roots. Results of unit root tests are summarized in the table 1.

Table 1 Unit Root tests

		order of integration of endogenous variables													
		FDI		**PI**		**DI**		**GDP**		**INF**		**IR**		**NEER**	
		ADF	PP	ADF	PP	ADF	PP	ADF	PP	ADF	PP	ADF	PP	ADF	PP
Bulgaria	A	I(1)	**I(0)**	I(1)	I(1)	I(1)	**I(0)**	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)
	B	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)
Czech republic	A	I(1)	I(1)	**I(0)**	I(1)	I(1)	**I(0)**	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)
	B	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)
Estonia	A	I(1)	I(1)	**I(0)**	I(1)	**I(0)**	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)
	B	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)
Hungary	A	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)
	B	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	**I(0)**	I(1)	I(1)	I(1)
Latvia	A	I(1)	I(1)	I(1)	I(1)	**I(0)**	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)
	B	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)
Lithuania	A	I(1)	**I(0)**	I(1)	I(1)	**I(0)**	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)
	B	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)
Poland	A	**I(0)**	I(1)	I(1)	I(1)	I(1)	**I(0)**	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)
	B	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	**I(0)**	I(1)	I(1)	I(1)	I(1)
Romania	A	I(1)	I(1)	I(1)	I(1)	**I(0)**	**I(0)**	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)
	B	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)
Slovak republic	A	I(1)	I(1)	I(1)	I(1)	I(1)	**I(0)**	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)
	B	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)
Slovenia	A	**I(0)**	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)
	B	**I(0)**	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)

Source: Author's calculations.

Both ADF and PP tests indicated that most of variables are non-stationary on the values so that the null hypothesis of a unit root cannot be rejected for any of the series. Testing variables on the first differences indicates the time series are stationary so that we conclude that most of endogenous variables are I(1).

B. Cointegration Test

Because there are endogenous variables with a unit root on the values it is necessary to the test the time series for cointegration using the Johansen and Juselius cointegration test. The test for the cointegration was computed using two lags as recommended by the AIC (Akaike Information Criterion) and SIC (Schwarz Information Criterion).

Results of cointegration tests are summarized in the table 2. Detailed results of unit root and cointegration tests are not reported here to save space. Like any other results, they are available upon request from the author.

To test the stability of the VEC model we also applied a number of diagnostic tests. We found no evidence of serial correlation, heteroskedasticity and autoregressive conditional heteroskedasticity effect in the disturbances. The model also passes the Jarque-Bera normality test, so that errors seem to be normally distributed. The VEC models seem to be stable also because the inverted roots of the models for each country lie inside the unit circle, although several roots are near unity in absolute value.

Table 2 Johansen and Juselius cointegration tests

Country	number of cointegrating equations											
	model A1		model A2		model A3		model B1		model B2		model B3	
	trace stat	max eigvalue stat	trace stat	max eigvalue stat	trace stat	max eigvalue stat	trace stat	max eigvalue stat	trace stat	max eigvalue stat	trace stat	max eigvalue stat
Bulgaria	2	2	0	1	1	1	1	1	0	0	0	0
Czech republic	1	1	1	1	1	1	0	1	0	0	0	1
Estonia	1	1	1	1	1	1	1	0	0	1	0	0
Hungary	1	1	0	1	1	0	0	0	1	0	0	1
Latvia	0	1	0	0	1	2	0	1	0	1	0	1
Lithuania	1	2	0	1	1	1	1	0	0	0	1	0
Poland	2	1	0	1	1	1	2	2	0	1	1	0
Romania	1	1	1	0	1	2	2	1	1	0	0	0
Slovak republic	1	1	0	1	1	0	0	2	1	0	0	1
Slovenia	1	1	0	1	0	0	1	2	1	0	1	0

Source: Author's calculations.

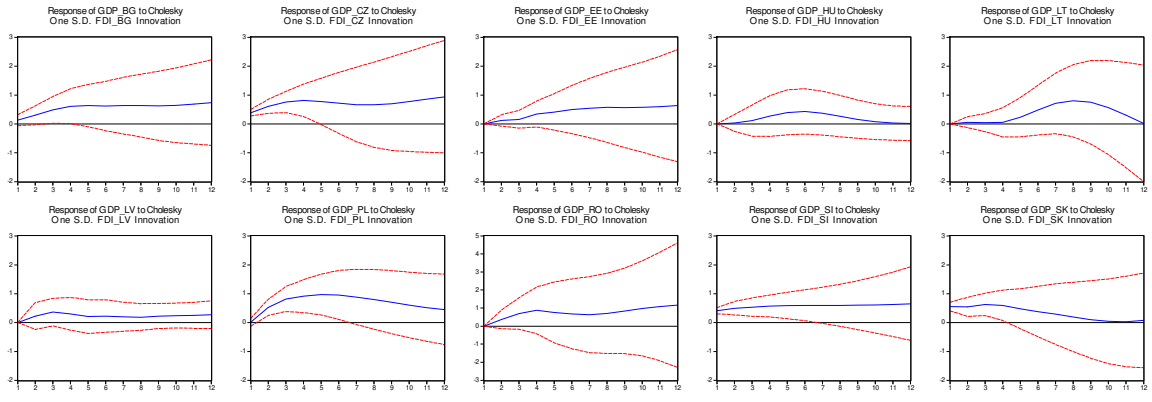
C. Impulse-Response Function

Following the results of the unit root and cointegration tests we estimate the model using the variables in the first differences so that we can calculate impulse-response functions (we focus on the responses of real output to foreign direct investments, portfolio investments and debt investments one standard deviation shocks) in each country from the Visegrad group. In the figure 3 and 4 we summarize impulse-response functions for models A1-A3 and B1-B3.

Model A1 $\left(Y_t = \left[\, fdi_t, y_t, p_t, i_t, er_{n,t} \,\right]\right)$

In the model A1 we focus on analysis of GDP responses to FDI one standard deviation shocks in the selected group of ETE in the period 2000-2007.

Figure 8 Responses of GDP to FDI shocks (Model A1)



Source: Author's calculations.

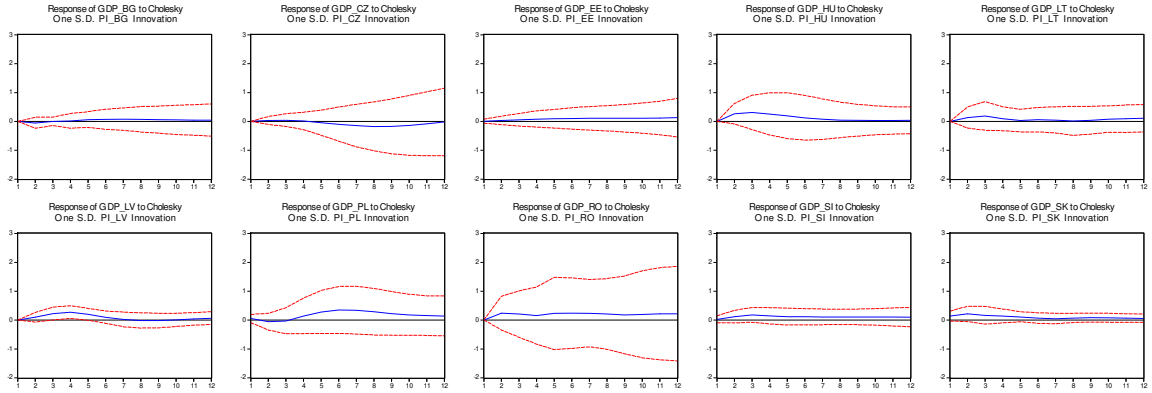
The figure 8 shows estimated responses of GDP to the Cholesky positive one standard deviation FDI shocks in the selected group of countries of ETE in the pre-crisis period. It seems to be clear that FDI shock was followed by an increase in real GDP in all countries. On the other hand there still some differences we have to emphasize. The overall extent as well as durability of the FDI shock differs across individual countries. While in the Czech republic,

Slovenia and Slovak republic the real GDP rose immediately after the shock, in Bulgaria, Latvia, Poland and Romania the real GDP rose after the initial period. Real GDP rose with lag in Estonia (two quarters), Hungary (three quarters) and Lithuania (five quarters). At the same time the lowest response of the real GDP to FDI shock we observed in Latvia and the highest in Poland. While in Bulgaria, Czech republic, Estonia, Latvia, Romania and Slovenia a positive effect of FDI shock on real GDP seems to be permanent, in Hungary, Lithuania and the Slovak republic the shock seems to have just a temporary effect and it died in with few years lag.

Model A2 $\left(Y_t = \left[pi_t, y_t, p_t, i_t, er_{n,t} \right]\right)$

In the model A2 we focus on analysis of GDP responses to portfolio investments one standard deviation shocks in the selected group of ETE in the period 2000-2007.

Figure 9 Responses of GDP to PI shocks (Model A2)



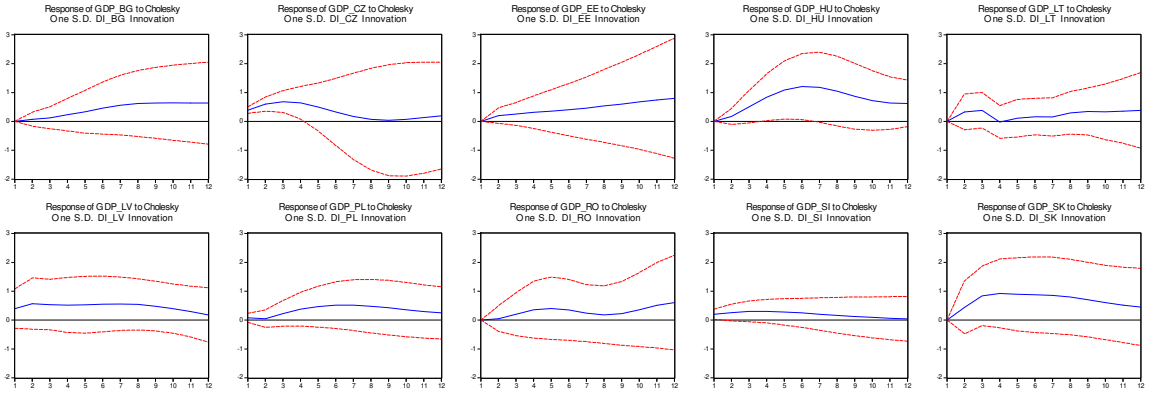
Source: Author's calculations.

The figure 9 depicts estimated responses of GDP to the Cholesky positive one standard deviation PI shocks in ETE in the pre-crisis period. Contrary to the effects of FDI shock, PI shock seems to determine a real GDP development in each individual country with much less intensity. Real GDP slightly rose immediately in response to PI shock in the Slovak republic only. Quite low, but still significant seems to be a lagged positive response of real GDP to one standard deviation PI shock in Hungary (one quarter), Lithuania (one quarter), Latvia (two quarters), Poland (four quarters), Romania (one quarter) and Slovenia (2 quarters). While in all ten ETE PI shock seems to be neutral in the long-run, in Bulgaria, Czech republic and Estonia our results indicates a neutrality in the short period too.

Model A3 $\left(Y_t = \left[di_t, y_t, p_t, i_t, er_{n,t} \right]\right)$

In the model A3 we focus on analysis of GDP responses to debt investments one standard deviation shocks in the selected group of ETE in the period 2000-2007.

Figure 10 Responses of GDP to DI shocks (Model A3)



Source: Author's calculations.

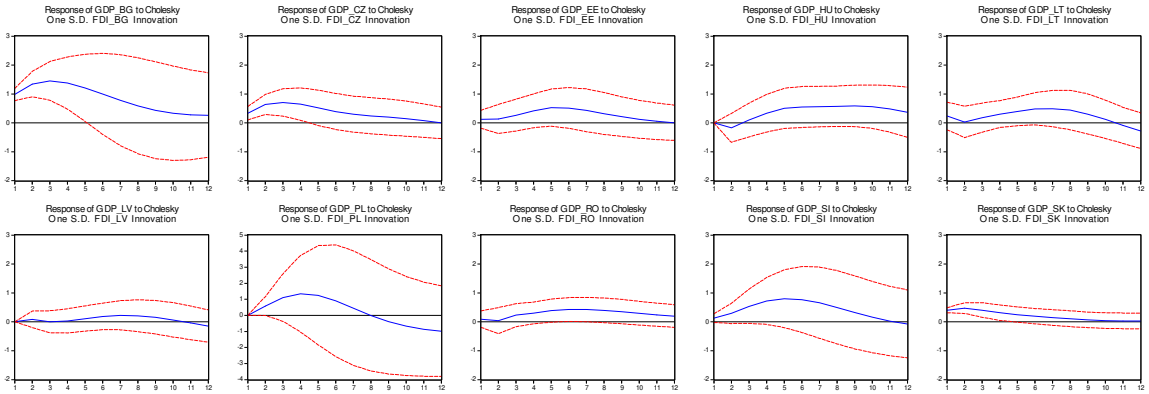
The figure 10 reflects estimated responses of GDP to the Cholesky positive one standard deviation DI shocks in all ten ETE in the pre-crisis period. As it seems effects of DI shocks on the real GDP development differs among countries the most. In the Czech republic, Latvia and Slovenia the real GDP rose immediately after DI shock. In all three countries a positive effect of the shock died out after few years so that it seems to neutral in the long period. Real GDP rose after the initial period as a result of a positive DI shock in Estonia, Lithuania and the Slovak republic. While in the Slovak republic a positive effect of the shock on the real GDP seems to be just a temporary, in Estonia and Lithuania the effect of the shock seems to permanent. In Bulgaria (three quarters), Hungary (two quarters), Poland (three quarters) and Romania (two quarters) real GDP responded to the one-time positive DI shock with lag.

Models with data from pre-crises period clearly reflect overall positive effects of FDI and DI on economies of all ten ETE. While we observed certain differences in length of lag needed for a shock to start determine a real GDP as well as a durability of positive effects of FDI and DI shocks, effects of PI shocks on the real GDP seem to be just negligible even in the short-run.

Model B1 $\left(Y_t = \left[fdi_t, y_t, p_t, i_t, er_{n,t} \right]\right)$

In the model B1 we focus on analysis of GDP responses to FDI one standard deviation shocks in the selected group of ETE in the period 2000-2010.

Figure 11 Responses of GDP to FDI shocks (Model B1)



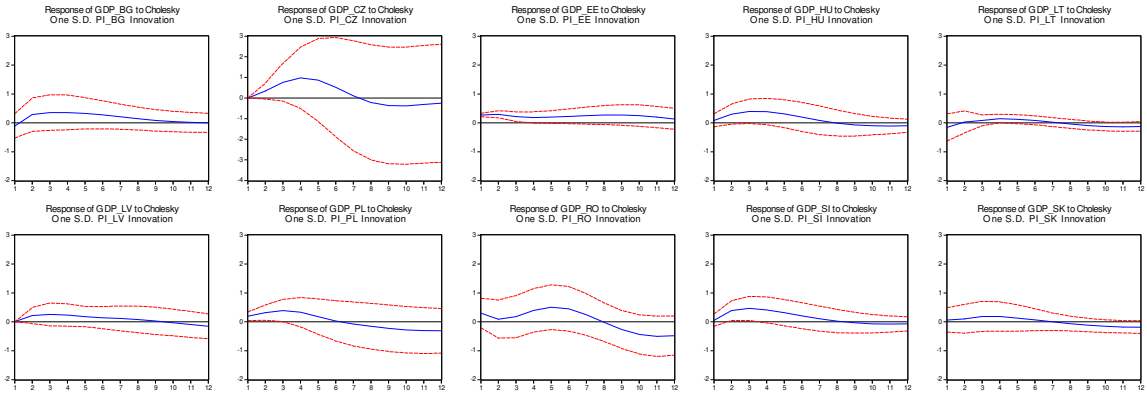
Source: Author's calculations.

The figure 11 shows estimated responses of GDP to the Cholesky positive one standard deviation FDI shocks in the selected group of countries of ETE in the extended period including years of economic crisis. In comparison our results with effects of the FDI shocks in the pre-crisis period it seems to be clear that years of crises affected not even a durability of the shocks but also a size of effects in the short-run. Short-time sensitivity of real GDP to the effects of the FDI shock slightly increased while a positive effect of the shock died out earlier in comparison with pre-crisis period. After a positive one standard deviation FDI shock GDP in Bulgaria, Czech republic and Slovak republic rose immediately. A lagged positive response of the real GDP we observed in Estonia (three quarters), Hungary (four quarter), Lithuania (two quarters), Latvia (five quarters), Poland (one quarter), Romania (two quarters) and Slovenia (one quarter).

Model B2 $\left(Y_t = \left[pi_t, y_t, p_t, i_t, er_{n,t} \right]\right)$

In the model B2 we focus on analysis of GDP responses to PI one standard deviation shocks in the selected group of ETE in the period 2000-2010.

Figure 12 Responses of GDP to PI shocks (Model B2)



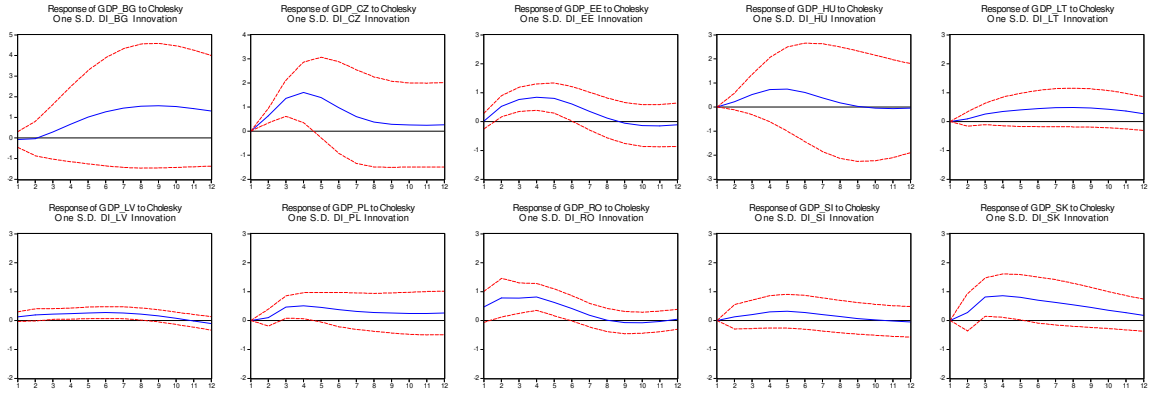
Source: Author's calculations.

The figure 12 reflects estimated responses of GDP to the Cholesky positive one standard deviation PI shocks in ETE in the extended period including years of economic crisis. Similarly to our findings about an impact of extended period on overall effects of FDI shocks we may conclude that years of economic crisis contributed to higher sensitivity of real GDP to PI shocks. Real GDP rose immediately after the positive PI shock in Estonia, Poland and Romania. Lagged but still positive response of real GDP we observed in Bulgaria (one quarter), Czech republic (one quarter), Hungary (one quarter), Latvia (one quarter), Slovenia (one quarter) and Slovak republic (two quarters). In Lithuania the PI shock still seems to be neutral in the short-run even after extending period for analysis. Positive PI shock seems to be neutral in the long-run too.

Model B3 $\left(Y_t = \left[di_t, y_t, p_t, i_t, er_{n,t} \right]\right)$

In the model B3 we focus on analysis of GDP responses to DI one standard deviation shocks in the selected group of ETE in the period 2000-2010.

Figure 13 Responses of GDP to DI shocks (Model B3)



Source: Author's calculations.

The figure 13 depicts estimated responses of GDP to the Cholesky positive one standard deviation DI shocks in all ten ETE in the extended period after including years of economic crisis. Similarly to our findings from models B1 the real GDP seems to be more sensitive to positive DI shocks but not for all countries. In most countries real GDP responded to the positive DI shock with reduced lag and slightly higher intensity, while duration of the shock seems to be reduced as it effects died out earlier. Contrary to this finding, response of the real GDP to positive DI shock in Latvia, Slovenia and Slovak republic was littler smaller.

Models with data from extended period reflect (similarly to result from pre-crisis period) overall positive effects of FDI and DI on economies of all ten ETE. Moreover real GDP in most countries rose even after positive PI shock. In general years of economic crisis reduced a durability of positive effects of all three shocks while in most countries responses of real GDP in short period slightly rose.

D. Granger Causality Test

To test for evidence of causality between the variables we employ Granger causality test. In a system of variables, a variable is said to be Granger-caused by another, if the second one helps in the prediction of the first one, or equivalently, if the coefficients on the lagged are statistically significant. For example, if two variables are cointegrated, that is, they have a common stochastic trend, and then causality in the Granger (temporal) sense must exist in at least one direction. We say that the first variable does not Granger cause the second if the lags of the first variable and the error correction term are jointly not significantly different from zero. Two-way causation is also possible and frequent.

Table 3 Granger causality tests

Bulgaria

model	null hypothesis	prob.	**model**	null hypothesis	prob.
A1	FDI_BG does not gc DP_BG	**0.0251**	**B1**	FDI_BG does not gc GDP_BG	**0.0741**
	GDP_BG does not gc FDI_BG	0.5380		GDP_BG does not gc FDI_BG	**0.0394**
A2	PI_BG does not gc DP_BG	0.2461	**B2**	PI_BG does not gc GDP_BG	0.6471
	GDP_BG does not gc PI_BG	0.3718		GDP_BG does not gc PI_BG	0.4365
A3	DI_BG does not gc GDP_BG	**0.0367**	**B3**	DI_BG does not gc GDP_BG	0.2157
	GDP_BG does not gc DI_BG	0.3850		GDP_BG does not gc DI_BG	0.5369

Czech republic

model	null hypothesis	prob.	model	null hypothesis	prob.
A1	FDI_CZ does not gc DP_CZ	**0.0043**	**B1**	FDI_CZ does not gc GDP_CZ	0.5417
	GDP_CZ does not gc FDI_CZ	0.6198		GDP_CZ does not gc FDI_CZ	0.3657
A2	PI_CZ does not gc DP_CZ	0.2411	**B2**	PI_CZ does not gc GDP_CZ	0.3251
	GDP_CZ does not gc PI_CZ	0.3672		GDP_CZ does not gc PI_CZ	0.5560
A3	DI_CZ does not gc GDP_CZ	**0.0127**	**B3**	DI_CZ does not gc GDP_CZ	0.4167
	GDP_CZ does not gc DI_CZ	0.2260		GDP_CZ does not gc DI_CZ	0.6132

Estonia

model	null hypothesis	prob.	model	null hypothesis	prob.
A1	FDI_EE does not gc DP_EE	**0.0026**	**B1**	FDI_EE does not gc GDP_EE	0.3712
	GDP_EE does not gc FDI_EE	0.5638		GDP_EE does not gc FDI_EE	**0.0063**
A2	PI_EE does not gc DP_EE	**0.0017**	**B2**	PI_EE does not gc GDP_EE	0.4980
	GDP_EE does not gc PI_EE	0.4279		GDP_EE does not gc PI_EE	0.3461
A3	DI_EE does not gc GDP_EE	**0.0549**	**B3**	DI_EE does not gc GDP_EE	0.2988
	GDP_EE does not gc DI_EE	0.2873		GDP_EE does not gc DI_EE	0.2411

Hungary

model	null hypothesis	prob.	model	null hypothesis	prob.
A1	FDI_HU does not gc DP_HU	**0.0185**	**B1**	FDI_HU does not gc GDP_HU	0.2845
	GDP_HU does not gc FDI_HU	0.3288		GDP_HU does not gc FDI_HU	0.5175
A2	PI_HU does not gc DP_HU	0.4366	**B2**	PI_HU does not gc GDP_HU	0.5244
	GDP_HU does not gc PI_HU	0.5790		GDP_HU does not gc PI_HU	0.4895
A3	DI_HU does not gc GDP_HU	**0.039**	**B3**	DI_HU does not gc GDP_HU	0.5562
	GDP_HU does not gc DI_HU	0.0419		GDP_HU does not gc DI_HU	0.6846

Latvia

model	null hypothesis	prob.	model	null hypothesis	prob.
A1	FDI_LV does not gc DP_LV	**0.0116**	**B1**	FDI_LV does not gc GDP_LV	0.5327
	GDP_LV does not gc FDI_LV	0.6389		GDP_LV does not gc FDI_LV	0.4733
A2	PI_LV does not gc DP_LV	0.3481	**B2**	PI_LV does not gc GDP_LV	0.3156
	GDP_LV does not gc PI_LV	0.2810		GDP_LV does not gc PI_LV	0.3996
A3	DI_LV does not gc GDP_LV	**0.0017**	**B3**	DI_LV does not gc GDP_LV	0.4785
	GDP_LV does not gc DI_LV	0.2658		GDP_LV does not gc DI_LV	0.4190

Lithuania

model	null hypothesis	prob.	model	null hypothesis	prob.
A1	FDI_LT does not gc DP_LT	**0.0289**	**B1**	FDI_LT does not gc GDP_LT	0.4283
	GDP_LT does not gc FDI_LT	0.3659		GDP_LT does not gc FDI_LT	0.4470
A2	PI_LT does not gc DP_LT	0.5683	**B2**	PI_LT does not gc GDP_LT	0.3893
	GDP_LT does not gc PI_LT	0.2899		GDP_LT does not gc PI_LT	0.5735
A3	DI_LT does not gc GDP_LT	**0.0039**	**B3**	DI_LT does not gc GDP_LT	0.4787
	GDP_LT does not gc DI_LT	0.3892		GDP_LT does not gc DI_LT	0.3321

Poland

model	null hypothesis	prob.	model	null hypothesis	prob.
A1	FDI_PL does not gc DP_PL	**0.0056**	**B1**	FDI_PL does not gc GDP_PL	**0.0029**
	GDP_PL does not gc FDI_PL	0.3958		GDP_PL does not gc FDI_PL	**0.0115**
A2	PI_PL does not gc DP_PL	0.4851	**B2**	PI_PL does not gc GDP_PL	0.3641
	GDP_PL does not gc PI_PL	0.2263		GDP_PL does not gc PI_PL	0.2885
A3	DI_PL does not gc GDP_PL	**0.0270**	**B3**	DI_PL does not gc GDP_PL	0.4480
	GDP_PL does not gc DI_PL	0.4933		GDP_PL does not gc DI_PL	0.3977

Romania

model	null hypothesis	prob.	model	null hypothesis	prob.
A1	FDI_RO does not gc DP_RO	**0.0083**	**B1**	FDI_RO does not gc GDP_RO	**0.0066**
	GDP_RO does not gc FDI_RO	0.5266		GDP_RO does not gc FDI_RO	0.2819
A2	PI_RO does not gc DP_RO	0.2281	**B2**	PI_RO does not gc GDP_RO	0.4483
	GDP_RO does not gc PI_RO	0.1195		GDP_RO does not gc PI_RO	0.3910
A3	DI_RO does not gc GDP_RO	**0.0107**	**B3**	DI_RO does not gc GDP_RO	**0.0226**
	GDP_RO does not gc DI_RO	0.5532		GDP_RO does not gc DI_RO	0.0419

Slovak republic

model	null hypothesis	prob.	model	null hypothesis	prob.
A1	FDI_SK does not gc DP_SK	**0.0081**	**B1**	FDI_SK does not gc GDP_SK	**0.0039**
	GDP_SK does not gc FDI_SK	0.3188		GDP_SK does not gc FDI_SK	0.6619
A2	PI_SK does not gc DP_SK	0.3829	**B2**	PI_SK does not gc GDP_SK	0.3892
	GDP_SK does not gc PI_SK	0.5521		GDP_SK does not gc PI_SK	0.5473
A3	DI_SK does not gc GDP_SK	**0.0177**	**B3**	DI_SK does not gc GDP_SK	0.1180
	GDP_SK does not gc DI_SK	0.0419		GDP_SK does not gc DI_SK	0.4872

Slovenia

model	null hypothesis	prob.	model	null hypothesis	prob.
A1	FDI_SI does not gc DP_SI	**0.0165**	**B1**	FDI_SI does not gc GDP_SI	**0.0084**
	GDP_SI does not gc FDI_SI	0.4521		GDP_SI does not gc FDI_SI	0.4327
A2	PI_SI does not gc DP_SI	0.2769	**B2**	PI_SI does not gc GDP_SI	0.2901
	GDP_SI does not gc PI_SI	0.4365		GDP_SI does not gc PI_SI	0.4729
A3	DI_SI does not gc GDP_SI	0.3821	**B3**	DI_SI does not gc GDP_SI	0.5199
	GDP_SI does not gc DI_SI	0.6180		GDP_SI does not gc DI_SI	0.5472

Source: Author's calculations.

Results of Granger causality test (Table 3) maybe summarized as follows. As we have expected tests confirmed causality between FDI and real GDP indicated by cointegration tests in all ten ETE. Due to a presence of temporal (short-term) causality it seems FDI granger cause economic growth so that it seems that economic development in these countries seems to be causally dependent of FDI inflows. Similar result we obtained by testing temporal causality between DI and real GDP. Our calculations suggest that DI granger cause real GDP in all countries but Slovenia. We found no evidence about temporal causality in opposite direction so that we may conclude that real GDP doesn't granger cause any type of foreign capital inflows in ETE considering model with data sets from pre-crisis period.

Analysis of causality between real GDP and main types of foreign capital inflows in ETE considering extended period provided some interesting findings. Inflows of FDI seems to granger cause real GDP in just five countries (Bulgaria, Poland, Romania, Slovak republic, Slovenia). At the same time none of all three types of foreign capital inflows seems to granger cause real GDP in the Czech republic, Hungary, Latvia and Lithuania. In the extended period DI doesn't seem to granger cause real GDP. Surprisingly we found evidence about temporal causality in opposite direction in Bulgaria, Estonia and Poland because it seems that real GDP granger cause FDI.

5. Conclusion

In the paper we observed main trends in the process of an international financial integration in ten ETE since 1995. To estimate effects of foreign capital inflows on the performance of ETE we analyzed effects of FDI, portfolio investments and other investments on the real output development. We estimated two VEC models (one with data sets for pre-crisis period only (2000-2007) and second for the whole period (2000-2010)). Comparison of

impulse-response functions and Granger causality tests among all ten countries as well as between both models provide following results.

Models with data from pre-crises period clearly reflect overall positive effects of FDI and DI on economies of all ten ETE. While we observed certain differences in length of lag needed for a shock to start determine a real GDP as well as intensity and durability of positive effects of FDI and DI shocks, effects of PI shocks on the real GDP seem to be just negligible even in the short-run.

Models with data from extended period reflect (similarly to result from pre-crisis period) overall positive effects of FDI and DI on economies of all ten ETE. Moreover real GDP in most countries rose even after positive PI shock. In general, years of economic crisis reduced a durability of positive effects of all three shocks while in most countries responses of real GDP in short period slightly rose.

Granger causality test confirmed an existence of temporal causality between FDI and DI (with exception of Slovenia) and real GDP in all ten countries only. On the other hand it seems a temporal causality endured even in the extended period in five countries only. We also found evidence about temporal causality in opposite direction in some countries because it seems that real GDP granger cause FDI.

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