JEL classification: F21, F32, F36
Keywords: capital inflows, EU transition countries, financial and real shocks, financial integration, sudden stops

From Financial Integration to Sudden Stops? New Evidence from EU Transition Countries*

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Abstract
This paper examines the temporal dynamics of the relationship between real and financial determinants of capital inflows and attempts to explain the background of the recent great sudden stop episode in EU transition countries. Using historical decomposition in a structural vector autoregression framework, we find that the major pre-crisis surge in capital inflows to EU transition countries coincides with a strong increase in correlation between the financial component and observed capital inflows. The consequences of these trends have been reflected in the high volatility of capital inflows and their retrenchment during the financial crisis. Analysis further shows that almost all sudden stop episodes in EU transition countries have been characterized by sudden increases in the volatility of financial components of capital inflows. Results are robust to various model specifications and different subcategories of capital inflows.

1. Introduction

With the development and expansion of financial globalization and trade liberalization, capital flows to emerging and developing economies have reached unprecedented levels over the past two decades. Among emerging and developing economies, transition countries of the European Union have attracted particularly large amounts of foreign capital. Higher interest rates than in developed countries, increased liquidity in the global markets, large-scale privatizations of government enterprises, financial deregulation, restructuring of foreign debt, prospects of high economic growth and access to EU funds have all had positive influences on foreign capital inflows into Central and Eastern European (CEE) transition countries[1] (Ötker-Robe *et al.*, 2007). The period of extremely high capital inflows ended abruptly in 2008 with the outbreak of the global financial crisis, which manifested in capital flight to safer forms of assets and a sudden stop in capital inflows to the region.

This paper provides a new and alternative view on the underlying reasons of recent sudden stop episodes in EU transition countries. Over the past decade, CEE countries have substantially increased their levels of financial integration with the core EU and eurozone countries, especially after joining the EU. As a result of extremely high capital inflows to the region, *de facto* levels of financial integration of EU transition countries almost doubled during the mid-2000s *vis-à-vis* the previous decade. Such developments were a reflection of global trends of increasing cross-

* The author wishes to thank two anonymous reviewers whose comments and insights were very helpful and increased the quality of this paper. This work has been supported by the Croatian Science Foundation under the project no. 7031.

[1] For the analysis of determinants and implications of capital flows to EU transition countries see, for example, Holub (1997), Gomulka (1998), Gibson and Tsakalotos (2004), Wolff (2007), Lipschitz, Lane and Mourmouras (2007), Hegerty (2009), Jevčák, Setzer and Suardi (2010), and Globan (2014b).

border investment, as well as the result of the increasing liberalization of financial accounts in EU transition countries and other economic policy reforms that have improved the development of financial markets in these countries (Lane and Milesi-Ferretti, 2007). The degree of financial account openness of EU transition countries measured by the *de jure* indicator developed by Chinn and Ito (2006, 2008) shows that the majority of countries had abolished almost all administrative and legal obstacles to the free flow of capital prior to entering the EU or shortly thereafter, as evidenced also by Ötker-Robe *et al.* (2007). The aforementioned developments led to the rapidly growing financial integration of capital markets in EU transition countries, ranging from the money market to bond and stock markets (Babetskii, Komárek and Komárková, 2007; Syllignakis and Kouretas, 2010).

Considering the growing financial integration of capital markets, growing financial ties between the new and core EU member states, and the strong growth in the size and influence of the financial sector in the global economy over the last decade, we hypothesize that the composition of capital flow determinants in EU transition countries has changed over time. We assume that financial factors (interest rate and monetary shocks) driving capital flows to EU transition countries have gained importance over the significance of real economic factors (productivity and output shocks). Furthermore, we argue that this increase in the significance of financial factors (determinants) of capital inflows, namely the hypothesis that capital inflows to EU transition countries over the last decade have been induced more by financial instead of real economic movements, was a catalyst which facilitated the onset and contributed to the severity of the recent sudden stop episode.

The importance of addressing the issue of significance of financial and real determinants of capital flows has been made especially clear by the recent global financial crisis. This paper builds upon a recent but fast-growing strand of literature which examines the connection between financial determinants of capital flows and sudden stops, and also deals with the question of whether financial integration and financial openness could be linked to an increase in a country's susceptibility to sudden stops. The previous research has implied that increasing financial openness, especially through the bilateral exposure of banking systems, makes the domestic country more vulnerable to sudden stops caused by either local or global investors (Forbes and Warnock, 2012; Calderón and Kubota, 2013) and that external vulnerability raises the likelihood of sudden stops and reduces the speed of adjustment of output to its equilibrium level (Caner, Koehler-Geib and Vincelette, 2009). Furthermore, financial factors, such as shocks in global interest rates and global liquidity, have been linked to the rising likelihood that emerging economies will experience sudden stops (Edwards, 2009).

Based on these studies, one can conclude that capital inflows that are dominantly determined by financial factors (e.g. global interest rate movements) are usually of a short-term and volatile character and are not sustainable in the long run because they are more often motivated by gaining speculative profits. On the other hand, research has shown that capital inflows that react more strongly to real economic shocks are usually of a long-term character, more stable, productive and sustainable in the long run and have a positive impact on the host economy (Goldstein, Mathieson and Lane, 1991; Edwards, 1991; Ying and Kim, 2001; Pirovano, Vanneste and van Poeck, 2009).

Using historical decomposition in a structural vector autoregression (SVAR) framework, we are able to decompose capital flows to the real and financial components and measure their relative significance in explaining the variation of observed capital flow series. We then test the dynamic volatility of both components of capital flows to find out whether there are significant behavior patterns which could help explain the dynamics of capital flows during sudden stop episodes. This study hypothesizes that the recent sudden stop episode in EU transition countries was primarily a result of a substantial decrease in the inflow of the highly volatile financial component of capital inflows, whereas the real component of inflows displayed significantly lower levels of volatility. Moreover, we test whether previous sudden stop episodes in EU transition countries could also be connected to rising volatilities in the financial component of capital inflows.

The contribution of this paper is reflected in the fact that it approaches the complex problem of the determinants of sudden stops from the aspect that has not yet been implemented and therefore contributes to the increasingly popular and fast-growing body of literature on sudden stops. Although the issue of comparison of real and financial determinants of capital flows has been addressed by several authors (Mody, Taylor and Kim, 2001; Chong *et al.*, 2003; de Vita and Kyaw, 2008), none of them has taken into account the dynamics of the relationship between the two components. In other words, the question of whether the impact of real and financial factors on capital inflows changes over various time periods has not been addressed, nor have the temporal dynamics of the volatility of the two components been analyzed. To fill this gap, this study econometrically extracts the components of capital inflows that are influenced by real and financial shocks separately. Moreover, the analysis is based on a longer period of time compared with previous research; unlike other papers it accounts for more than just one sudden stop episode, and the fact that it includes all three major types of capital inflows contributes to its robustness.

The rest of the paper is structured as follows: Section 2 carries out the literature review on sudden stops and their link with financial integration. Section 3 discusses methodological details, while Section 4 presents the data used in the analysis. The results of the empirical model are presented in Section 5. Section 6 discusses policy implications of the results obtained in the study.

2. Literature Review

The literature on the determinants of capital flows is extensive, whereas one common topic that runs through most of the research is whether global capital flows are driven by "push" factors that are external to the country or by country-specific "pull" factors. However, researchers have yet to reach a consensus on the matter. A significant number of authors have presented evidence for the dominance of domestic economic factors (e.g. economic growth, fiscal balance, productivity shocks, exchange rate appreciation, credit rating, credit to the private sector and capital restrictions) in attracting large amounts of capital inflows to developing countries (Chuhan, Claessens and Mamingi, 1993; Montiel and Reinhart, 1999; Hernández, Mellado and Valdés, 2001; Mody, Taylor and Kim, 2001; Fiess, 2003; Çulha, 2006). On the other hand, the growing importance of global factors and economic shocks (e.g. economic growth and interest rates in advanced economies, global liquidity and

risk, contagion effects) has been proven by Calvo, Leiderman and Reinhart (1993), Gavin, Hausmann and Leiderman (1995), Fernández-Arias (1996), Dooley, Fernández-Arias and Kletzer (1996), Kim (2000), Ying and Kim (2001), Edison and Warnock (2003), Forbes and Warnock (2012), Globan (2014a) and others.

On the other hand, the literature that deals with determinants of specific sudden stop episodes is not as ample, but has been growing fast. In a seminal paper on extreme capital flow episodes, Calvo (1998) defined sudden stops as sharp slowdowns in net capital inflows which may have serious disruptive consequences for the host economy, for instance render the country insolvent, dramatically reduce the productivity of its existing capital and/or lead to currency and banking crises. Calvo, Izquierdo and Mejía (2004, 2008) and Montiel (2013) developed theoretical models which emphasize external imbalances (large current account deficits and exchange rate overvaluations), currency mismatches (as a degree of dollarization) and the sensitivity of the real exchange rate to capital flow reversals as the main determinants of sudden stops. Other possible domestic ("pull") determinants have been tested, focusing primarily on the stability of external and fiscal accounts, the soundness of the macroeconomic policy framework and fragility in the financial sector, but a consistent empirical proof could be found only for the link between high current account deficits and sudden stops (Calvo, Izquierdo and Mejía, 2004, 2008; Cavallo and Frankel, 2008; Kaminsky, 2008; Edwards, 2009; Sula, 2010).

Our hypothesis is supported by the recent strand of literature which examined the connection between financial factors and sudden stops, and also dealt with the question of whether financial integration and openness could be linked to an increase in a country's susceptibility to sudden stops. In a recent paper, Calderón and Kubota (2013) found that increasing financial openness makes the domestic country more vulnerable to sudden stops caused by either local or global investors, while Caner, Koehler-Geib and Vincelette (2009) found that external vulnerability raises the likelihood of sudden stops and reduces the speed of adjustment of output to its equilibrium level. Forbes and Warnock (2012) proved that a country's trade and financial openness, especially through the bilateral exposure of banking systems, is an important determinant of sudden stops. Finally, Edwards (2009) found that changes in global financial conditions, e.g. an increase in the world real interest rate signalling a reduction of global liquidity, raise the likelihood that emerging economies will experience sudden stops.

While most of the existing empirical research focuses on measuring the relative impact of external *vis-à-vis* domestic determinants of capital flows (push vs. pull factors), only a few authors have dealt with the comparison of relative impacts of shocks in real and financial factors on capital flows. Furthermore, their results offer no unanimous answer to the question of which of the two groups of shocks has a stronger impact. De Vita and Kyaw (2008) found evidence on a sample of five developing countries that real variables (the domestic and U.S. real GDP growth rates) explain the variation in capital inflows better than financial variables (interest rates in the U.S. and the domestic money supply). A similar result was obtained by Mody, Taylor and Kim (2001), who emphasize the importance of real economic activity in the United States as the dominant determinant of capital flows to developing countries *vis-à-vis* the influence of financial factors (interest rates). On

the other hand, some authors point to the heterogeneity of the impact of real and financial shocks, depending on the type of capital inflows. For example, Chong *et al.* (2003) found that real factors are more important in determining the variation of foreign direct investment (FDI) inflows, whereas financial factors are more significant determinants of portfolio investment. However, the aforementioned studies did not take into account the temporal dynamics of capital flow determinants, i.e. they did not deal with the question of whether the significance of real and financial factors has changed over different time periods and, if so, how. This study attempts to fill that gap.

The implications of the composition of capital inflow determinants have been examined by several authors. Previous research has shown that capital inflows that react more strongly to real economic shocks are usually of a long-term character and have a positive impact on the host economy (Goldstein, Mathieson and Lane, 1991; Edwards, 1991; Ying and Kim, 2001; Pirovano, Vanneste and van Poeck, 2009). Specifically, if capital inflows are primarily determined by a strong positive performance in the real sector of the domestic economy, then such inflows are usually more stable, productive and sustainable in the long run because local governments may have a greater impact on their management by implementing sound macroeconomic policies.

On the other hand, capital inflows that are predominantly determined by financial factors (e.g. global interest rate shocks), are usually of a short-term and volatile character and are not sustainable in the long run because they are more often motivated by gaining speculative profits. Such capital is prone to sudden flight from the country, which increases the difficulty of maintaining macroeconomic stability in the host country because the government's policy instruments may have less of an effect its movement (Calvo, Leiderman and Reinhart, 1993; Ying and Kim, 2001; Çulha, 2006; de Vita and Kyaw, 2008; Hegerty, 2009; Jevčák, Setzer and Suardi, 2010; Fratzscher, 2012). These findings served as the rationale for our hypothesis that sudden stop episodes in EU transition countries have been connected to rising levels of volatility in the financial component of capital inflows, which will be tested in this study.

3. Methodology

Prior to introducing the methodological details of the econometric model, it is necessary to define what constitutes a sudden stop episode. Following Calvo, Izquierdo and Mejía (2004) and Guidotti, Sturzenegger and Villar (2004), in order for the period to be identified as a sudden stop episode, two out of the three following criteria must be met. A decrease in capital inflows in a given quarter *vis-à-vis* the corresponding quarter from the previous year must be greater than 5% of GDP or greater by at least 1.5 standard deviations. Also, a decrease in capital inflows in a given quarter *vis-à-vis* average capital inflows in the whole analyzed period must be greater by at least 1.5 standard deviations. The beginning of the sudden stop episode is marked by a quarter preceding the described peaks of crisis episodes in which the inflows decrease by at least 1% of GDP *vis-à-vis* the previous quarter, while the end of the episode is marked by a quarter in which the inflows increase by at least 1% of GDP *vis-à-vis* the previous quarter.

An empirical analysis is carried out on a sample of eight non-eurozone EU transition countries—Bulgaria, Croatia, the Czech Republic, Hungary, Latvia, Lithuania[2], Poland and Romania. The reason why Slovenia, Slovakia and Estonia have been omitted from the analysis is the fact that these countries ceased to control their money supply by joining the monetary union. Furthermore, the purpose of the model was to capture both domestic and external financial shocks. Specifically, the eurozone interest rate stopped being an external variable and became a domestic variable for these three countries at the moment they joined the eurozone. Following Ying and Kim (2001), de Vita and Kyaw (2008) and Globan (2014a), a structural vector autoregressive model of capital flows in a small, open economy is estimated. Small, integrated European economies face exogenously determined foreign output and interest rates which affect the real and financial spheres of the domestic economy. The model thus includes two sets of shocks that determine the movement of capital flows—real and financial shocks. Real shocks include a shock in eurozone output and a domestic productivity shock. Financial shocks include a shock in eurozone interest rates and a domestic monetary shock. The model includes the autonomous shock in capital inflows which can occur for a variety of reasons that are not covered by previous shocks, e.g. sudden changes in inflation rates, the degree of trade liberalization and changes in the portfolio structure of investors (Ying and Kim, 2001).

The rationale for including the aforementioned shocks in the model is the following: A negative output shock in the eurozone should have a negative effect on the profitability of companies and investors, and thus on the volume of disposable capital for investment in EU transition economies. A negative eurozone output shock can be viewed as a negative demand shock for EU transition economies which leads to lower domestic interest rates and, consequently, lower capital inflows. On the other hand, a negative substitution between output growth in the creditor country and capital inflows to the recipient country could also take place. Specifically, a recession in advanced economies could make investment in that group of countries more profitable, as evidenced by Calvo, Leiderman and Reinhart (1996).

A negative eurozone interest rate shock should have a positive influence on capital inflows to the transition economies for more than one reason. Given the fact that capital, especially that of a short-term nature, moves towards higher returns, a decrease in the eurozone interest rates should motivate foreign investors to internationally diversify their portfolios and invest in EU transition countries. On the other hand, lower interest rates in the eurozone could mean lower refinancing costs of foreign debt for transition economies, which could indirectly improve their creditworthiness and ability to access international debt flows of capital.[3]

[2] Latvia joined the eurozone on 1 January 2014, and Lithuania on 1 January 2015, but the time span of the analysis includes only the pre-accession period.

[3] Perhaps a useful and related point is to examine the interest rate differentials between the analyzed countries and the eurozone. The full analysis is available in the online appendix. In short, it is clear that there is a general downward trend in interest rate differentials over time (1995–2011). However, renewed growth in interest rate differentials took place in the last quarter of 2008 due to the spread of the global financial crisis and the sharp increase in the risk premium in all analyzed countries. The peak was reached in mid-2009, after which they started to decline to pre-crisis levels due to the normalization of the situation in the financial markets.

Positive domestic productivity shocks are considered by most authors to be factors that attract foreign capital to developing countries, given that such shocks imply higher capital efficiency, which has been confirmed empirically (Kim, 2000; de Vita and Kyaw, 2008; Hegerty, 2011). Finally, the influence of domestic monetary shocks (shocks in the money supply) stems from the standard and widely recognized Mundell-Fleming-Tobin model. Regardless of the exchange rate regime, a positive monetary shock will result in an increase in liquid assets, a fall in domestic interest rates and, consequently, a decrease in capital inflows.

Furthermore, the selection of the aforementioned shocks builds upon the existing empirical and theoretical literature (see, for example, Blanchard and Quah, 1989; Ahmed *et al.*, 1993; Ahmed and Park, 1994; Clarida and Gali, 1994; Bayoumi and Eichengreen, 1994; Glick and Rogoff, 1995; Kim, 1996; Agénor, 1998; Ying and Kim, 2001; de Vita and Kyaw, 2008; Globan, Arčabić and Sorić, forthcoming 2015) is comprehensive as the shocks can be viewed not only in terms of shocks in the real and financial spheres of the economy, but also from the aspect of domestic and external shocks, or from the aspect of demand and supply shocks.

Total gross capital inflows ($INFLOW_t$) are modelled as:

$$INFLOW_t = f_1\left(u_t^{reu}, u_t^{feu}, u_t^{rd}, u_t^{fd}, u_t^{inf}\right) \tag{1}$$

where $INFLOW_t$ is a function of the shock in the eurozone output $\left(u_t^{reu}\right)$, the eurozone interest rate shock $\left(u_t^{feu}\right)$, the domestic productivity shock $\left(u_t^{rd}\right)$, the domestic monetary shock $\left(u_t^{fd}\right)$ and the shock in total capital inflows $\left(u_t^{inf}\right)$.[4]

With respect to the research hypothesis, the model includes two groups of endogenous variables that describe domestic and external real economic movements (domestic and eurozone real GDP growth rates— EU_GDP_t and GDP_t, respectively) and external and domestic trends in the financial sphere of the economy (eurozone interest rates— $EURIBOR_t$, and the domestic growth rate of money supply— MS_t), respectively. The fifth endogenous variable is total gross inflow of foreign capital ($INFLOW_t$).

Although most studies of sudden stops rely on estimates of net capital flows, recent research has emphasized the advantages of analyzing gross capital inflows in empirical studies of sudden stops (Fostel and Kaminsky, 2008; Forbes and Warnock, 2012; Accominotti and Eichengreen, 2013; Cavallo *et al.*, 2013), given that measures of sudden stops constructed from net inflows are not able to differentiate between stops that are due to the actions of foreign investors (capital inflows) and those due to domestic investors fleeing the domestic market (capital outflows).

Given that structural shocks from (1) are unobservable, additional assumptions in the model are necessary to disclose the structural shocks. In order to extract the five structural shocks identified in (1), a five-variable SVAR model is estimated:

[4] The model used in this paper does not allow for possible asymmetries in the effects of negative and positive shocks on capital flows. To check whether capital flows react with different intensity depending on whether the shock is a positive or a negative one is a potentially fruitful topic for future research.

$$\mathbf{y_t} = \mathbf{\Theta}(\mathbf{L})\mathbf{u_t} = \sum_{s=0}^{\infty} \mathbf{\Theta_s} \mathbf{u_{t-s}} \tag{2}$$

where $\mathbf{y_t} = \left(EU\_GDP_t, EURIBOR_t, GDP_t, MS_t, INFLOW_t\right)'$, and $\mathbf{\Theta}(\mathbf{L}) = \sum_{s=0}^{\infty} \mathbf{\Theta_s} \mathbf{L^s}$, where

L is a lag operator, $\mathbf{\Theta_s}$ a matrix of impulse responses of endogenous variables to structural shocks. A vector of structural shocks is given by $\mathbf{u_t} = \left(u_t^{reu}, u_t^{feu}, u_t^{rd}, u_t^{fd}, u_t^{inf}\right)'$.

Finally, the model specifies the assumptions about the long run effects of structural shocks. $\sum_{s=0}^{\infty} \mathbf{\Theta_s} = \mathbf{\Theta}(\mathbf{1}) = \left\{\theta_{ij}(1)\right\}$ represents the matrix of accumulated long run effects of structural shocks. There are three basic assumptions regarding the long run effects of structural shocks. First, shocks in capital inflows are transitory and do not have a long-term impact on any other variable. This defines four restrictions in matrix $\mathbf{\Theta}(\mathbf{1})$, namely $\theta_{15}(1) = \theta_{25}(1) = \theta_{35}(1) = \theta_{45}(1) = 0$. Second, only foreign shocks have a long-term impact on foreign variables. This assumption is based on the fact that changes in macroeconomic variables in small open economies of EU transition countries do not have a long-term impact on growth rates and interest rates in the eurozone. This defines four new elements of matrix $\mathbf{\Theta}(\mathbf{1})$, namely $\theta_{13}(1) = \theta_{14}(1) = = \theta_{23}(1) = \theta_{24}(1) = 0$. Third, financial variables do not have a long-term impact on real variables. This assumes that the eurozone interest rate shock will not have a long-term effect on the eurozone GDP growth rate, while the domestic monetary shock will not have a long-term effect on the domestic GDP growth rate. The lack of the long-term impact of changes in nominal variables to real variables is a stylized fact of macroeconomic analysis. This defines final two elements of matrix $\mathbf{\Theta}(\mathbf{1})$, namely $\theta_{12}(1) = \theta_{34}(1) = 0$.

The three groups of restrictions make $\mathbf{\Theta}(\mathbf{1})$ a lower triangular matrix. In a SVAR system of five variables it is necessary to impose $(k^2 - k)/2 = 10$ restrictions in order to identify structural shocks ($\mathbf{u_t}$) from reduced form shocks. Given that exactly ten restrictions have been imposed, the model is just identified.

Blanchard and Quah (1989) first implemented the empirical method of identifying unobservable structural shocks from observable variables based on a SVAR model. One of the advantages of this approach is the fact that, by utilizing long-term assumptions based on economic theory, the number of assumptions necessary to identify the structural shocks that are imposed arbitrarily is reduced. Among others, this approach has been used in empirical macroeconomic analysis by King *et al.* (1991), Ahmed *et al.* (1993), Clarida and Gali (1994), Kim (1996; 2000), Ying and Kim (2001), de Vita and Kyaw (2008), Korap (2010) and Globan (2014a).

The results of the econometric analysis will be presented using only one component of the SVAR framework—historical decomposition.[5] The first paper using historical decomposition was by Burbidge and Harrison (1985) and has since remained popular in macroeconomic analysis.[6] It provides insight into the contributions

of individual shocks to the observed data series. The actual data series is the sum of contributions of all components (shocks) added to the base forecast. One gets an insight into what data would have been generated if some linear combinations of the residuals had been zero rather than what was actually observed if one or more of components (shocks) is omitted (Doan, 2010).

The stationarity of variables is tested in the next section. It is assumed that the structural shocks in vector u_t are mutually uncorrelated and with unit variance. The optimal lag length entering the model was selected by minimizing the Akaike information criterion.[7] The presence of serial correlation in the residuals was tested using the multivariate Hosking *Q*-statistics test. The results, which are available upon request, indicate that the null hypothesis of no serial correlation in the residuals could not be rejected. Furthermore, the stability of estimated SVAR models has been tested by checking whether the roots of a characteristic polynomial lie outside of a unit circle. The results, which are available upon request, imply the stability of all estimated SVAR models.

4. Data

The analyisis employs quarterly data for the period between 1997:Q1 and 2011:Q4. Due to data availability issues, in the case of Poland, Romania and Latvia this period is somewhat shorter.[8] The data on capital inflows were downloaded from the IMF's International Financial Statistics (IFS) database. Total capital inflows were obtained by the sum of gross inflows of FDI, portfolio and other investment. Capital inflows are presented in the form of moving annual cumulatives, calculated as shares of GDP. *Figure 1* provides a graphical representation of time series of capital inflows in the analyzed countries.

The data on real GDP growth rates were downloaded from the Eurostat database. These time series represent the percentage change in real GDP in a given quarter compared to the corresponding quarter of the previous year. Interest rate data (three-month EURIBOR) were downloaded from the IFS. Finally, the money supply growth rate is represented by the percentage change in the M1 monetary aggregate.[9] The sources for the money supply data were IFS and Eurostat. Money supply time

[5] The usual components of the SVAR framework, impulse response functions (IRF) and forecast error variance decomposition (FEVD) analyses are not included due to the lack of space and the fact that historical decomposition is more suitable for answering the research question in this paper. However, both IRF and FEVD analyses have been conducted and are available upon request.

[6] For the application of historical decomposition in recent macroeconomic analysis, e.g. decomposing capital flows and inflation in new EU member states to push and pull factors, see Globan (2014a) and Globan, Arčabić and Sorić (forthcoming 2015), for example.

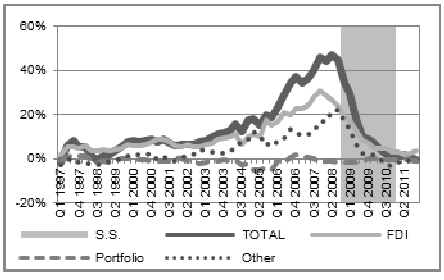
[7] In several cases, the optimal number of lags in the SVAR proposed by the Akaike information criterion was insufficient to resolve the serial correlation issues. In those cases additional lags were included in the model until the serial correlation problems were completely resolved. In the end, the number of lags entering the model is as follows: Bulgaria—3 lags, Croatia—1 lag, Czech Republic—1 lag, Hungary—2 lags, Latvia—2 lags, Lithuania—2 lags, Poland—1 lag, Romania—1 lag.

[8] The analysis for Latvia starts from 1998, for Romania from 1999, and for Poland from 2000.

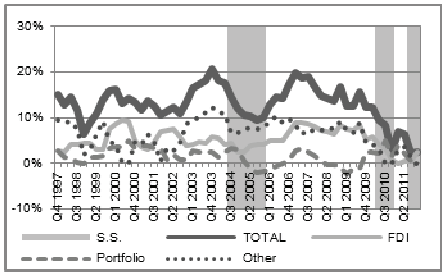
[9] The main reason for using the M1 monetary aggregate instead of, for example, M2 or M3 was data availability. For example, Croatia does not have the M2 aggregate at all. M1 was the only monetary aggregate for which the data was available for all eight countries. Thus, for the sake of consistency and comparability, M1 has been chosen as an indicator of money supply.

Figure 1 Capital Inflows to Non-Eurozone EU Transition Countries, by Types of Flows (in percent of GDP)

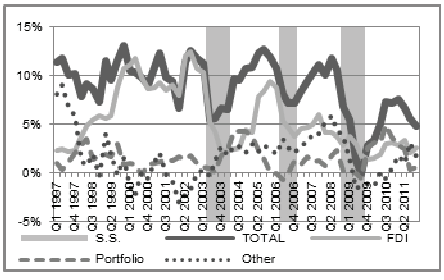
(a) Bulgaria



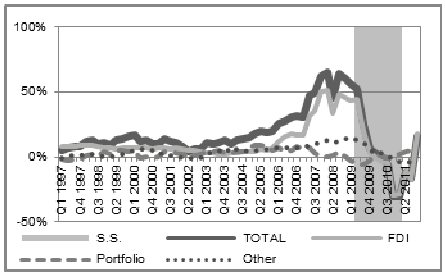
(b) Croatia



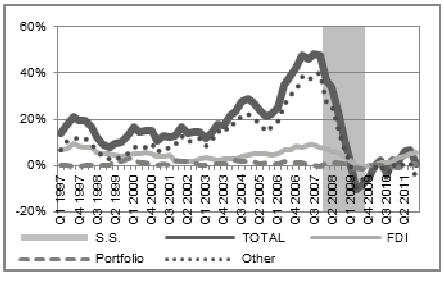
(c) Czech Republic



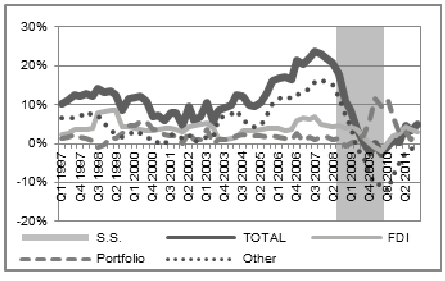
(d) Hungary



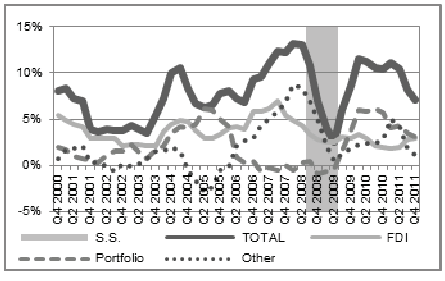
(e) Latvia



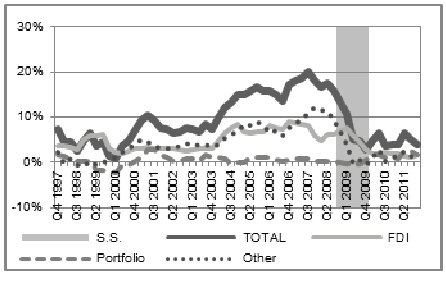
(f) Lithuania



(g) Poland



(h) Romania



Note: Shaded areas denote periods of sudden stop episodes (labelled as S.S.).

Sources: IMF-IFS; the author's calculations.

Table 1 Results of Augmented Dickey-Fuller Unit Root Tests

Variable	*t*-statistics	Variable	*t*-statistics	Variable	*t*-statistics
Bulgaria		*Czech Republic*		*Croatia*	
INFLOW_BUL	-1.99* (5 lags)	*INFLOW_CZE*	-2.73** (4 lags)	*INFLOW_CRO*	-2.53* (3 lags)
GDP_BUL	-2.84** (3 lags)	*GDP_CZE*	-2.23* (11 lags)	*GDP_CRO*	-2.22* (4 lags)
MS_BUL	-6.41** (1 lag)	*MS_CZE*	-3.16** (5 lags)	*MS_CRO*	-3.19** (1 lag)
Latvia		*Lithuania*		*Hungary*	
INFLOW_LAT	-2.22* (9 lags)	*INFLOW_LIT*	-2.98** (3 lags)	*INFLOW_HUN*	-2.17* (8 lags)
GDP_LAT	-2.27* (5 lags)	*GDP_LIT*	-2.71** (4 lags)	*GDP_HUN*	-3.14** (1 lag)
MS_LAT	-2.95** (0 lags)	*MS_LIT*	-2.37* (2 lags)	*MS_HUN*	-2.15* (8 lags)
Poland		*Romania*		*Eurozone*	
INFLOW_POL	-4.48** (1 lag)	*INFLOW_ROM*	-2.27* (11 lags)	*EU_GDP*	-2.77** (1 lag)
GDP_POL	-2.31* (0 lags)	*GDP_ROM*	-3.63** (1 lag)	*EURIBOR*	-2.90** (1 lag)
MS_POL	-5.81** (0 lags)	*MS_ROM*	-3.24** (1 lag)		

Notes: The non-stationarity hypothesis can be rejected at: **1 percent significance level, *5 percent significance level. The number of lags in each ADF regression was selected by minimizing the Akaike and Schwarz information criterion. Critical values were generated by the *WinRATS 8* software.

series have been deflated by the CPI index and, ultimately, log-differenced in order to obtain their growth rates. The series were seasonally adjusted using the X11 procedure in the WinRATS 8 software.

In accordance with the procedure used by Blanchard and Quah (1989), deterministic components (constant and trend) were removed from all time series. The stationarity of time series was tested using the Augmented Dickey-Fuller (ADF) and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) unit root tests. *Table 1* carries out the results of the ADF test, while the KPSS test results are not reported due to space issues but are available upon request. The results of both tests showed that all time series are in a stationary form at the usual levels of significance and as such can be included in the SVAR model.[10]

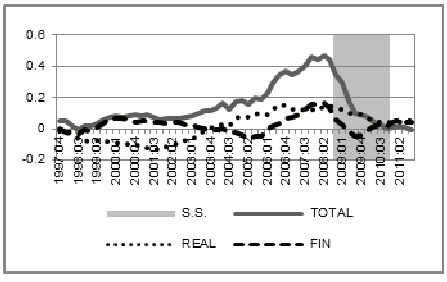
5. Results

Historical decomposition was used to examine the temporal dynamics of the relative significance of real and financial shocks on total capital inflows to EU transition countries. The capital inflows component under the direct influence of real

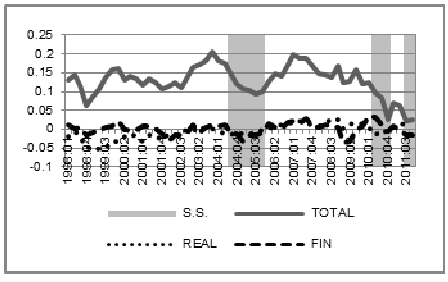
[10] Given that the standard ADF test is prone to the type II error, i.e. it is biased towards the rejection of a false null hypothesis in the presence of a structural break in the series (Perron, 1989), we considered employing the Zivot-Andrews unit root test to test the stationarity of time series. However, the results of both ADF and KPSS tests showed that all time series are in a stationary form, which means that no such problem exists.

Figure 2 Historical Decomposition of Total Capital Inflows in EU Transition Countries, Real vs. Financial Component

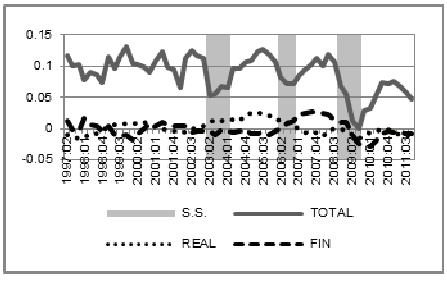
(a) Bulgaria



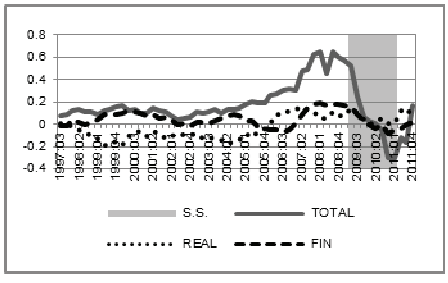
(b) Croatia



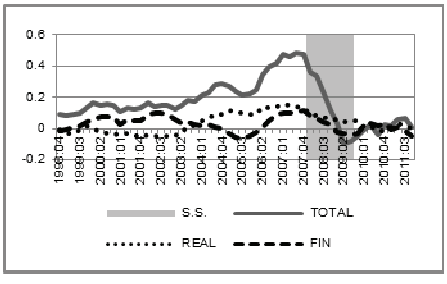
(c) Czech Republic



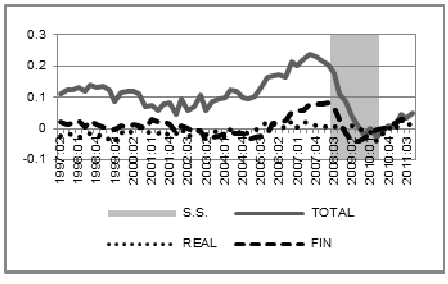
(d) Hungary



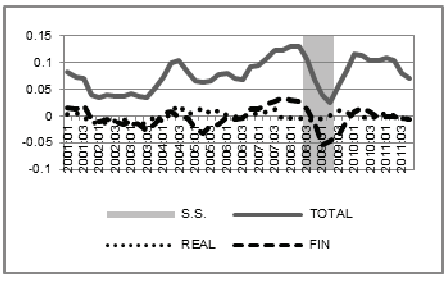
(e) Latvia



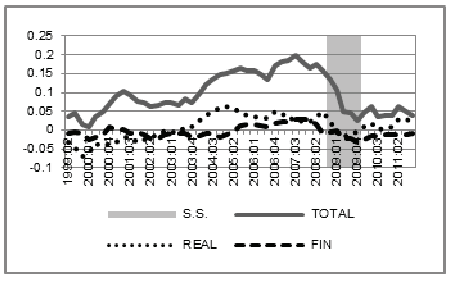
(f) Lithuania



(g) Poland

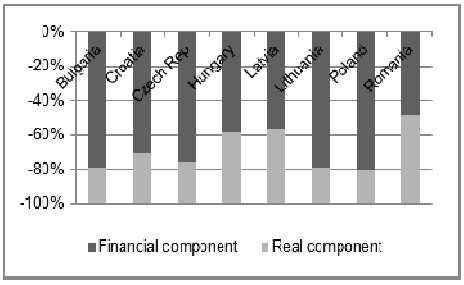


(h) Romania



Notes: The solid line displays actual total capital inflows, the dotted line displays capital inflows under the influence of real shocks (*REAL* component), and the dashed line displays capital inflows under the influence of financial shocks (*FIN* component). Shaded areas denote the periods of sudden stops in total capital inflows (labelled as S.S.)

Figure 3 The Share of *REAL* and *FIN* Components in the Recent Sudden Stop in Total Capital Inflows



shocks is given by *REAL*, which summarizes the impact of eurozone output and domestic productivity shocks on capital inflows. The capital inflows component under the direct influence of financial shocks is given by *FIN*, which summarizes the impact of eurozone interest rate and domestic monetary shocks.

Figure 2 displays the movement of components obtained by historical decomposition in relation to the movement of actual total capital inflows in each analyzed country. It reveals that the component of capital inflows under the influence of financial factors declined during the recent sudden stop episode more quickly and more intensively than the component under the influence of real factors.

Figure 3 displays how much of the sudden stop in total capital inflows happened due to the decline in the *FIN* and *REAL* components. The graph confirms that the sudden stop was primarily a result of the decline in the inflow of the financial component of capital inflows in all analyzed countries except Romania, where the shares were roughly equal.

In order to gain insight into the correlations between the movements of components obtained by historical decomposition and the actual total capital inflows, the static and dynamic correlation coefficients were calculated for the entire period of analysis, as well as for three sub-periods, roughly covering the period before and after the countries' entry into the European Union and the period before and after the onset of the financial crisis. Dynamic correlations have been obtained by centred moving correlation coefficients covering the period of three years (12 observations). The results show that the static correlation between the *FIN* component and observed capital inflows increased in the second sub-period, exceeding the correlation coefficient of the *REAL* component in most countries (*Table 2*). This indicates that financial factors had become more important for the dynamics of capital inflows than real factors on the eve of the crisis, as well as after the accession of these countries to the EU, indicating higher levels of financial integration of EU transition countries with core EU countries.

The dynamic correlation analysis provides similar results. *Figure 4* reveals an upward trend in the correlation of *FIN* and observed capital inflows in the pre-crisis period in all countries. The trend started in the mid-2000s, reached a peak on the eve and during most of the financial crisis period, when it exceeded the correlation of *REAL* in all countries, after which it loses significance. It is evident that the surge in capital inflows, which happened between 2006 and 2008, coincides with

Table 2 Coefficients of Correlation between Total Capital Inflows and Components from Historical Decomposition in Three Sub-Periods

Period	*REAL*	*FIN*	Period	*REAL*	*FIN*	Period	*REAL*	*FIN*
Bulgaria			*Croatia*			*Czech R.*		
97q1–04q1	0.19	0.41	*97q1–04q1*	0.62	0.57	*97q1–04q1*	-0.22	-0.05
04q2–08q3	0.84	0.95	*04q2–08q3*	0.58	0.83	*04q2–08q3*	0.33	-0.26
08q4–11q4	0.94	-0.02	*08q4–11q4*	0.32	0.13	*08q4–11q4*	0.67	0.62
Hungary			*Latvia*			*Lithuania*		
97q1–04q1	-0.36	0.67	*97q1–04q1*	0.43	0.41	*97q1–04q1*	0.58	0.52
04q2–08q3	0.74	0.68	*04q2–08q3*	0.82	0.89	*04q2–08q3*	0.83	0.90
08q4–11q4	0.54	0.97	*08q4–11q4*	0.03	0.46	*08q4–11q4*	0.78	0.54
Poland			*Romania*					
97q1–04q1	0.75	0.87	*97q1–04q1*	0.72	0.37			
04q2–08q3	-0.28	0.93	*04q2–08q3*	-0.29	0.73			
08q4–11q4	0.18	0.92	*08q4–11q4*	0.23	0.63			

the period of the strong increase in the correlation between the financial component and actual capital inflows.

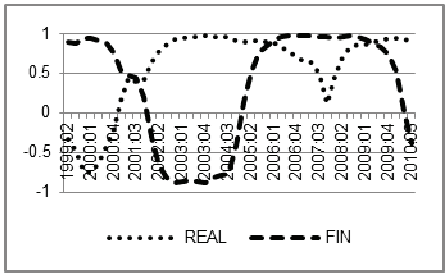
This implies that capital inflows to the analyzed countries throughout this period were influenced by financial factors, i.e. the conditions in the financial markets, more than they reflected the situation in the real sector of the economy in EU transition countries or the eurozone. The detrimental implications of these trends became prominent in late 2008, as *Figure 2*, *Figure 3* and *Figure 4* reveal that the sudden stop was largely a result of the decline in the inflow of capital that was under the direct influence of financial factors.

The question arises as to whether it was the domestic or external financial factors that had a more profound influence on capital flows to EU transition countries. *Figure 5* displays the shares of external and domestic financial shocks in the forecast error variance decomposition of capital flows. It is evident that the shocks in eurozone interest rates had an overwhelmingly larger influence on capital flows than domestic monetary shocks in all of the analyzed countries. This could indicate rising levels of financial integration of EU transition countries with the eurozone, but it could also indicate the potential risks of such processes given that the dynamics of capital inflows are largely influenced by variables out of their control.

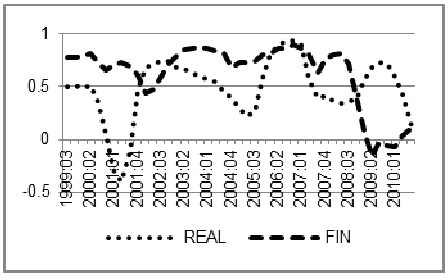
The implications of such a composition of capital inflow determinants in EU transition countries are multifaceted. Volatile capital inflows, mostly short-term types of flows, can have adverse impacts on the host economy from the macro and micro aspects, which has been empirically proven (see Claessens, Dooley and Warner, 1995; Chuhan, Perez-Quiros and Popper, 1996; Rodrik and Velasco, 1999; Sarno and Taylor, 1999; Calvo and Reinhart, 2000) and it is something that becomes particularly apparent in times of financial crisis. *Figure 6* shows that the episodes of sudden stops in EU transition countries have been connected to volatility levels of the financial component of capital inflows. It is evident how almost all sudden stop episodes

Figure 4 Dynamic Coefficients of Correlation between Total Capital Inflows and Components from Historical Decomposition

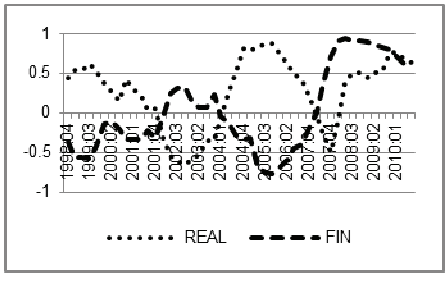
(a) Bulgaria



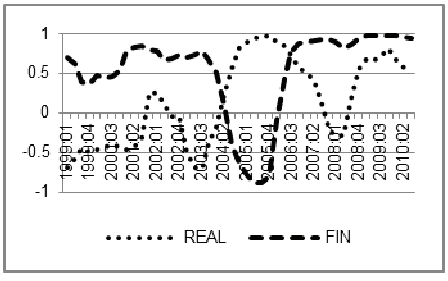
(b) Croatia



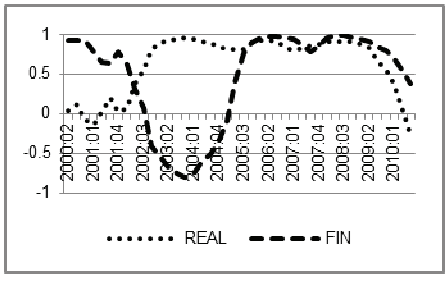
(c) Czech Republic



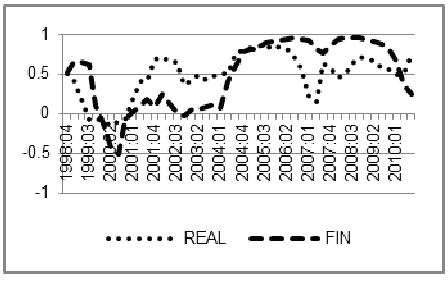
(d) Hungary



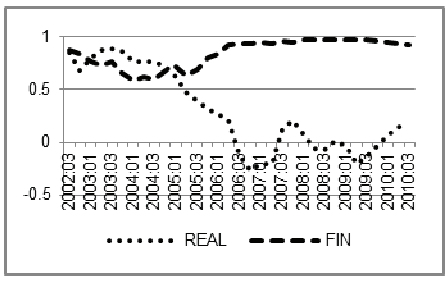
(e) Latvia



(f) Lithuania



(g) Poland



(h) Romania

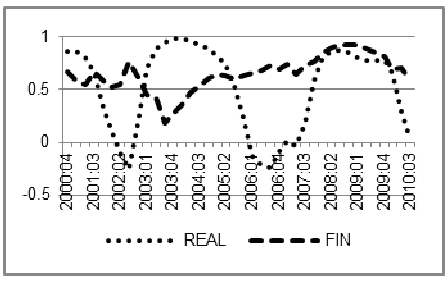
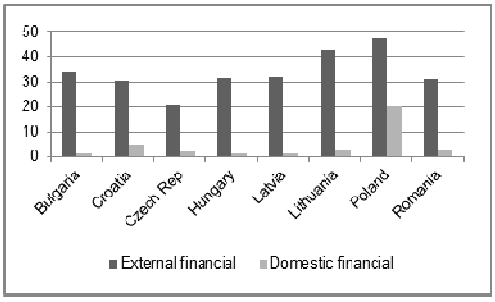


Figure 5 The Shares of External and Domestic Financial Shocks in the Variance Decomposition of Capital Flows, 16 Quarters after a Shock, in percent



have one common feature—they are characterized by rapid and noticeable increases in the volatility of the financial component of capital inflows.[11]

On the other hand, the real components of capital inflows, namely components affected by developments in the real sector of the economy, on average, display significantly lower levels of volatility. It can be observed that the volatility of real components often does not increase even in times of financial crisis and sudden stops. This speaks in favour of the hypothesis that an increase in the significance of financial components leads to capital inflows becoming more prone to sudden stops. There were several spikes in in the volatilities of financial components during the early and mid-2000s that did not result in sudden stops, which could be related to the fact that financial components were not yet as significant then as they were in the late 2000s.

Additional analysis has been implemented in order to further explore the potential implications of the dominance of the financial component in the dynamics of capital inflows. *Figure 7* reveals a positive relationship between the average correlation of the financial component with observed capital inflows (both in the crisis and pre-crisis periods) and the intensity of the sudden stop in total capital inflows across the analyzed countries.

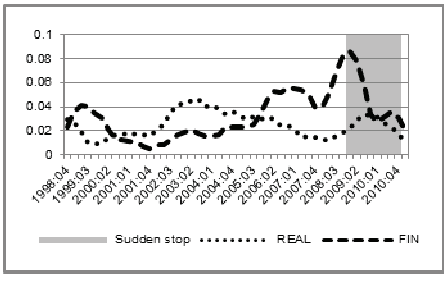
Moreover, the analysis shows a positive relationship between the average correlation of the financial component with observed capital inflows (both in the crisis and pre-crisis periods) and the volatility of total capital inflows during the crisis (*Figure 8*). This means that, on average, countries whose capital inflows had been under the greater influence of financial factors, both in the crisis and pre-crisis periods, experienced more intensive sudden stops and more volatile capital inflows during the recent financial crisis.

Furthermore, *Figure 9* reveals a positive relationship between the average volatilities of the financial components of capital inflows (pre-crisis, during the crisis and during the whole period) and the intensity of sudden stops. This suggests that

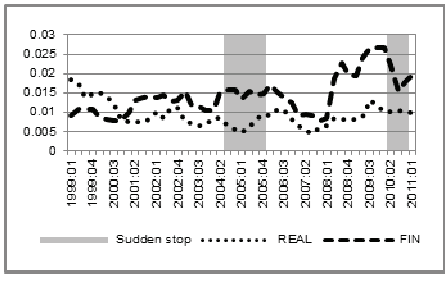
[11] Due to availability issues, the time span of the data implemented in this paper does not include periods of other financial crises, e.g. the Asian crisis. The question of whether the real and financial components of capital flows behaved differently during other crisis episodes is a potentially fruitful topic for future research.

Figure 6 Dynamic Volatility of the Components of Total Capital Inflows (two-year moving standard deviations)

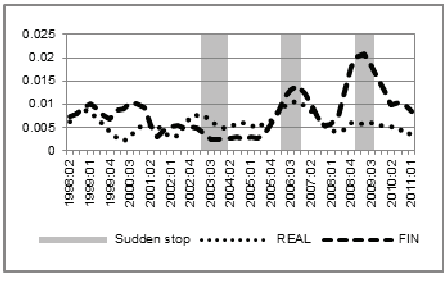
(a) Bulgaria



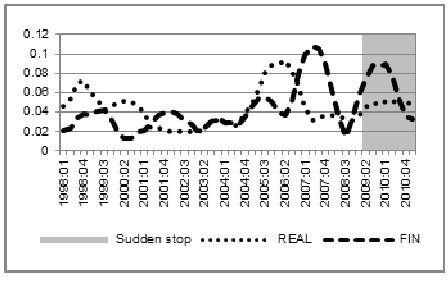
(b) Croatia



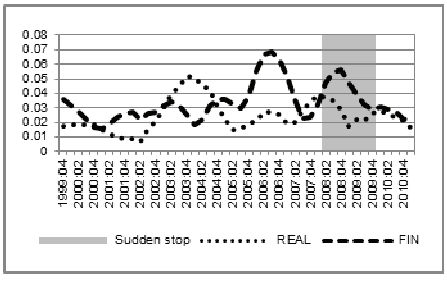
(c) Czech Republic



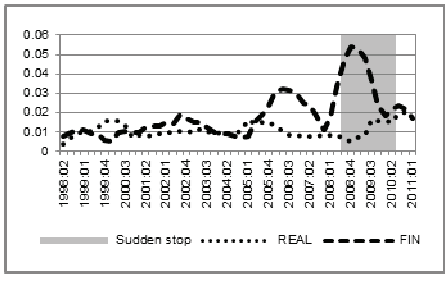
(d) Hungary



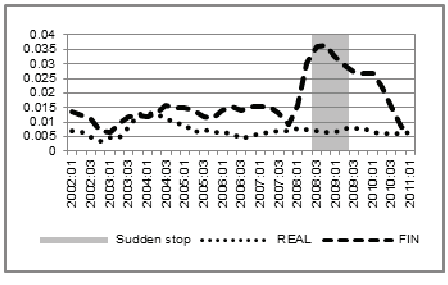
(e) Latvia



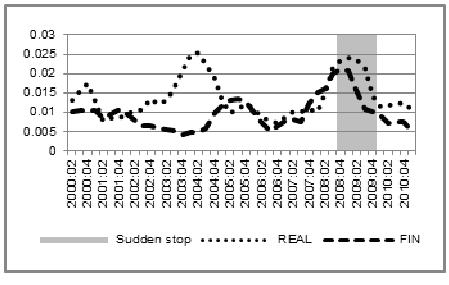
(f) Lithuania



(g) Poland



(h) Romania



Note: Shaded areas denote the periods of sudden stops in total capital inflows.

Figure 7 Correlation of the Financial Component with Total Capital Inflows vs. the Intensity of the Sudden Stop in Total Capital Inflows (in percent of GDP)

(a) Pre-crisis period (b) Crisis period

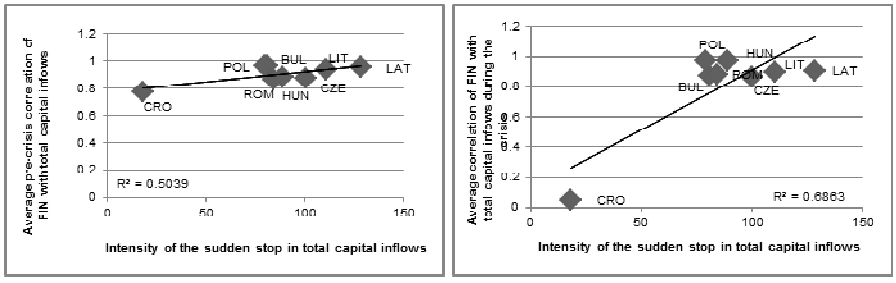


Figure 8 Correlation of the Financial Component with Total Capital Inflows vs. the Volatility of Total Capital Inflows (standard deviation)

(a) Pre-crisis period (b) Crisis period

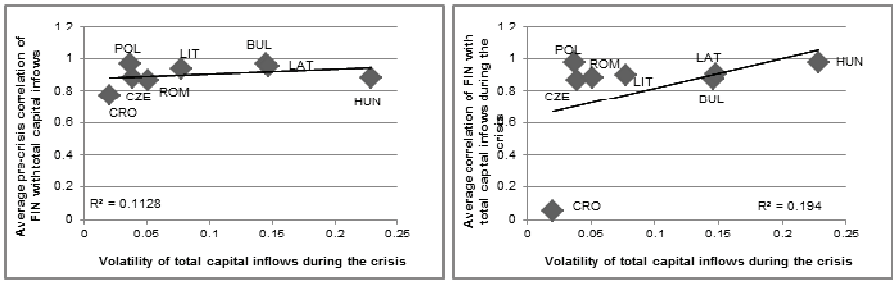
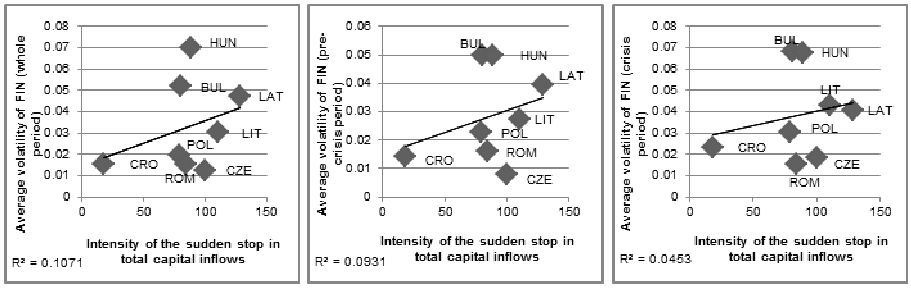


Figure 9 Volatility of the Financial Component of Capital Flows vs. the Intensity of the Sudden Stop in Total Capital Inflows (in percent of GDP)

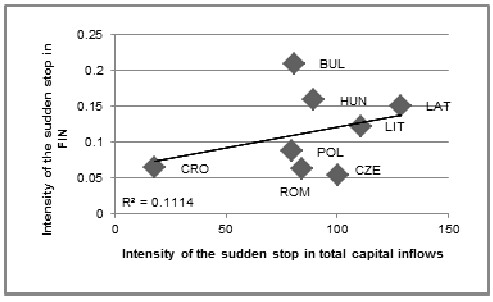
(a) Whole period (b) Pre-crisis period (c) Crisis period



countries whose financial components had been more volatile experienced, on average, more intensive sudden stops during the recent financial crisis.[12]

Finally, the analysis reveals that countries whose financial component of capital inflows had decreased more prominently, experienced, on average, more intensive sudden stops in total capital inflows during the crisis (*Figure 10*). The positive

Figure 10 Intensity of the Sudden Stop in the Financial Component of Capital Flows (in percent of GDP) vs. the Intensity of the Sudden Stop in Total Capital Inflows (in percent of GDP)



relationship between both the level of correlation of financial factors with actual capital inflows and their volatility levels on the one hand and the intensity of the resulting sudden stops on the other hand speaks in favour of the hypothesis that such capital inflows are more volatile, speculative and less sustainable in the long run.

An extensive robustness check was conducted in order to determine whether the results of the econometric model are robust to various model specifications. Three separate models with individual types of capital inflows instead of total capital inflows were estimated. These models include inflows of FDI, portfolio investment and other investment. The results of these robustness checks are available in the *Appendix* on the website of this journal.

6. Conclusion

This paper examined the temporal dynamics of the relationship between the real and financial determinants of capital inflows and attempted to explain the background of the recent great sudden stop episode in EU transition countries in an innovative and alternative way. The aim of the empirical analysis was to test whether the financial integration process has resulted in increased significance of the financial component of capital inflows and whether the rise in the significance and volatility of the financial component could be linked to the proneness to and severity of sudden stop episodes in EU transition countries.

Using historical decomposition in a SVAR framework, capital inflows were decomposed to the real and financial components, while their relative significance in explaining the variation of observed capital flow series was measured. The results revealed a noticeable increase in the significance of financial factors in determining the dynamics of total capital inflows, and all their subcategories, to EU transition countries over the last decade. The analysis showed that the major increase in capital inflows to EU transition countries, which occurred in the period 2006–2008, coincides with a strong increase in correlation between the financial component and

[12] In several scatter plots, Croatia appears as an outlier. For robustness check purposes, correlations excluding Croatia were calculated to verify whether the results still hold. In the case of *Figure 7*, *Figure 8* and *Figure 10,* the coefficients of determination drop significantly and the correlations between the variables do not seem as strong. The plots are reported in the *Appendix* on the website of this journal.

observed capital inflows. This implies that capital inflows to EU transition countries throughout that period were influenced more by financial factors, specifically conditions in the financial markets (predominantly external), than they reflected the situation in the real sector of the economy. The consequences of such a composition of capital inflow determinants have been reflected in the high volatility of capital inflows and their retrenchment during the financial crisis. The analysis showed that the reduction in capital inflows has largely been a result of changes in financial rather than real factors.

There are several potential causes of these trends. The increase in the significance of financial factors in determining the capital flow dynamics in EU transition countries implies an increase in the level of integration of domestic financial markets with the developed markets of the core EU countries and the eurozone in particular, which is consistent with the findings of Chinn and Ito (2006, 2008), Lane and Milesi-Ferreti (2007), Ötker-Robe *et al.* (2007), Babetskii, Komárek and Komárkova (2007) and Syllignakis and Kouretas (2010). However, this result could also be a consequence of the rapid development of global financial markets and the growing influence and the size of the financial sector in the global economy, which culminated at the end of the last decade and resulted in the global financial crisis and a sudden stop in capital flows to EU transition countries.

Analysis of the dynamic volatility of both components of capital inflows showed that almost all sudden stop episodes in EU transition countries are characterized by sudden increases in the volatility of the financial components of capital inflows. On the other hand, real components behaved in a significantly less volatile manner, in most cases remaining stable even during sudden stop episodes. The results are robust to various model specifications and different subcategories of capital inflows.

The results of this study point to the conclusion that the increasing significance of financial components entails the presence of several non-negligible macroeconomic risks for the host economies. The dominance of financial factors in capital flow dynamics makes these flows more volatile, which makes the occurrence of economic boom-bust cycles and sudden stops more likely. The consequences of such events could be reflected in banking and currency crises, deep recessions and rising levels of unemployment. The recent financial crisis clearly revealed the economic risks of highly volatile capital inflows. A study by the IMF (2011) has shown that the recent sudden stop episode in emerging countries exposed errors in economic policy in the pre-crisis period. Specifically, not enough effort had been made in terms of macroprudential measures and fiscal discipline, which made the impact of the sudden stops on the domestic economies more pronounced. The increasing pertinence of financial factors in the capital flow dynamics shown in this paper stresses the importance of leading more responsible domestic monetary policies and sound macro-prudential supervision during expansionary periods, during which capital tends to flow in large quantities into emerging markets.

In such circumstances, it is very important to make efforts to strengthen the domestic financial and regulatory infrastructure and increase the levels of vigilance of domestic policymakers towards external policy decisions, as well as the levels of policy coordination between the EU transition countries and the eurozone. This

would help increase the level of readiness of domestic policymakers to manage capital inflows more efficiently, reduce information asymmetries and protect the economy from the risks of volatile capital flows. The dangers of financial globalization for small, open economies could be mitigated if domestic authorities make efforts in deepening the domestic financial system (see, for example, Schmitz, 2011; IMF, 2012), enlarging the base of domestic investors and trying to reduce the level of the "original sin" by developing domestic-currency bond markets. Moreover, improving the domestic institutional quality, government transparency and rule of law could make domestic financial markets less volatile and more resilient to both domestic and external financial shocks, which could significantly help reap the well-documented benefits of financial integration.

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