

Understanding the drivers of capital flows into the CESEE countries

We analyze the relationship between global factors and country-specific capital flow dynamics in a sample of 12 Central, Eastern and Southeastern European (CESEE) countries from 1994 until 2014. We detect a pronounced time-varying pattern of capital flow volatility that mirrors well-known crisis episodes in several instances. We show that the global co-movement of macroeconomic, financial and capital flow variables is able to explain the lion's share of volatility of gross capital inflows into CESEE economies and that it became even more important after the 2008/09 global financial crisis. In particular, global financial factors that approximate the global financial cycle explain by far the largest share of capital flow volatility, followed by the global real business cycle component. If common global factors are dominant in explaining the volatility of gross capital inflows, a combination of better international coordination of economic policies, macroprudential measures or capital flow management instruments is advisable to smooth the capital flow cycle. We also show that gross capital inflows were so sizeable in some countries between 2003 and 2008 that common global (financial) factors like the buildup of global leverage were not as dominant as in other periods – a result that could partly be the outcome of the strategic positioning of foreign banks in the region.

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Historically, boom-bust cycles in capital flows display striking similarities. Extensive capital inflows tend to fuel the buildup of macroeconomic imbalances, such as excessive credit (including foreign exchange-denominated lending), rising currency mismatches, surging property and asset prices, and inflationary and currency appreciation pressures. Sudden stops and reversals of capital flows usually trigger sharp economic downturns with a lasting impact and leave the banking system with rising nonperforming loans that act as an additional drag on lending.

Very often, volatile cross-border capital flows represent a challenge to cyclical conditions in emerging and advanced economies alike. Recent examples are the surge of capital flows to some emerging markets in the aftermath of monetary accommodation in the advanced economies following the global financial crisis and the withdrawal of cross-border capital from some emerging economies after the Federal Reserve System's (Fed's) tapering announcement in May 2013 (see IMF, 2016).

It seems that capital flows are driven by some global factors. Calvo et al. (1993, 1996) already recognized this and distinguished global “push” factors from the country-specific “pull” factors. Rey (2015) as well as Passari and Rey (2015) show that capital flows follow a global financial cycle, as the monetary conditions of the main financial centers may spill over to other countries. It follows that even under flexible exchange rate regimes, the autonomy of monetary policy and financial stability may be jeopardized.

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Eller et al. (2016b, unpublished mimeo) also find strong evidence for a global financial cycle. They use a factor stochastic volatility model to study the relationship between global macroeconomic and financial factors and country-specific capital flow dynamics for a sample of 39 countries worldwide from 1994 until 2014. They show that the global co-movement of macroeconomic, financial and capital flow variables is able to explain a major share of country-specific capital flow volatility across all the considered regions and that this impact has become more important in the aftermath of the global financial crisis.

This paper is based on material and insights presented in Eller et al. (2016b), digging deeper into the single-country results for the CESEE region and asking to which extent the global co-movement of macroeconomic, financial and capital flow variables is relevant for explaining fluctuations of capital flows across 12 CESEE countries.² Two interrelated characteristics make the CESEE region stand out: First, during the 2008/09 crisis, the CESEE region as a whole suffered larger output declines than any other region in the world (Berglöf et al., 2009). Second, the size of capital inflows into CESEE before the crisis hit, in particular in the years following the 2004 EU enlargement round, was just as extraordinary. It is well understood that the severe boom-bust cycle in capital flows that CESEE experienced, the strength of this cycle, its macrofinancial implications as well as the evolution of flows by type of capital differed markedly between countries. In general, countries that were receiving the largest capital inflows before the crisis saw the largest reversals, too, and suffered from deep recessions thereafter as a consequence of a liquidity (credit supply) shock and a slump in export demand (EBRD, 2009; Bakker and Klingens, 2012).

What is less well understood, however, is the extent to which this extraordinary influx of capital before the crisis as well as capital flow dynamics thereafter were driven by global common factors or by regional or country-specific phenomena. A respective breakdown allows us to better understand the nature and origins of capital flow dynamics. The economic policy implications are far-reaching. If global factors are dominant, standard textbook prescriptions may no longer apply and the case can be made for better international coordination, for macroprudential measures that limit the reliance on short-term external funding, such as loan-to-deposit ratios or bank levies on noncore bank liabilities,³ or for capital flow management measures. However, any policy recommendation has to be based on a concise cost-benefit analysis of open capital accounts, which is beyond the scope of this paper.

Studying a sample of 12 CESEE countries from 1994 until 2014, we detect a pronounced time-varying pattern of capital flow volatility that mirrors well-known crisis episodes in several instances. We thus opt to use a framework that is capable of exploiting large datasets and of accounting for shifts in the volatility of the time series involved. Our approach, closely related to the factor stochastic volatility framework of Pitt and Shephard (1999) and Aguilar and West (2000), provides new insights into the relative importance of different fundamental factors

² CESEE-12: Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Russia, Slovakia, Slovenia and Turkey.

³ To limit the global financial cycle that is to a large degree transmitted via banks, Shin (2010) proposed a tax on noncore liabilities at a global level.

across time and space. Since the sensitivity of capital flows to global fundamental factors is subject to structural breaks in the parameters, we assume that the factor loadings are time-varying (following Del Negro and Otrok, 2008).

From our dataset, we extract global factors for macroeconomic variables (GDP growth, inflation, exchange rate dynamics and the trade balance), financial sector variables (short-term and long-term interest rates, changes in equity prices, and private sector credit and deposits), and the respective capital flow variable under investigation (direct, portfolio and other investment flows). For each capital flow variable, we also extract a regional factor that captures common capital flow dynamics within the CESEE region. The global (and regional) factors are used to provide a parsimonious representation of the data, effectively capturing the prevailing co-movement in the dataset. Importantly, we impose the restriction that the factors are, by construction, orthogonal to each other and thus possess a structural interpretation. This implies that the factors do not affect each other directly. Ultimately, a variance decomposition exercise informs us to which extent the extracted factors are able to explain a particular share of the volatility of different types of capital flows in different CESEE countries over time.

The remainder of the paper is structured as follows: Section 1 gives an overview of the capital flow dynamics in CESEE. Section 2 describes the properties of the econometric framework used in our analysis. Details on the database are added in section 3. Section 4 delineates our main results. We find that gross capital inflows were largely driven by factors external to the region, even more so after the global financial crisis. Section 5 discusses some policy options, and section 6 concludes.

1 Capital flows by countries and by type of capital

In the early 2000s, the CESEE countries started to attract large net and gross capital inflows that became particularly sizeable after 2003 when measured relative to the recipient's GDP (see charts 1 and 2 for gross capital inflows and charts A.1 and A.2 in the annex for net flows). As Bakker and Gulde (2010) mentioned, the size of capital inflows into the ten CESEE countries that joined the EU between 2004 and 2007 exceeded that of capital inflows into Southeast Asian countries prior to the 1997/98 Asian crisis. Between 2000 and 2008, cumulative *net capital inflows* into our CESEE-12 sample were nearly 50% of 2000 GDP on average, with the Baltic countries, Bulgaria, Romania, Slovakia and Hungary showing a respective share of considerably more than 100% each (see also chart A2).⁴ By contrast, in a comparable period between 1989 and 1997, before the Asian crisis, Indonesia or the Philippines accumulated net capital inflows of just 50% or 100%, respectively, of their 1989 GDP.

In terms of capital type, net portfolio investment flows were largely negligible (except in Hungary) during the pre-crisis boom period, whereas cross-border bank loans (the bulk of other investment flows) were the most important category, followed by foreign direct investment (FDI) (except in Bulgaria, the Czech Republic, Slovakia and Poland, where FDI exceeded other investment). A large share of these other investment and/or portfolio flows is typically considered to be suscep-

⁴ Sum of direct, portfolio and other investment flows between 2000 and 2008, divided by 2000 GDP (everything in current prices and current U.S. dollars).

tible to sudden withdrawals, whereas FDI reflects both real and financial investment and is more of a medium- to long-term nature. The comparatively vigorous growth in cross-border bank-related financial flows during this period reflects the underlying credit boom in CESEE, the associated stronger growth of credit than of deposits, and the expansion of Western European banks and their centralized funding model, under which funds were channeled to subsidiaries and branches in CESEE (Lane and McQuade, 2013).

In the following descriptive analysis, we focus primarily on gross capital inflows⁵ (charts 1 and 2). We also look at net capital flows (charts A1 and A2 in the annex), which are the counterpart of the current account, because the difference between net and gross figures is sizeable in central Europe (except in Poland), the Baltic countries and Russia. In these countries, gross capital inflows were to some extent compensated by higher investment abroad by domestic agents. Interestingly, gross capital inflows and outflows are not strongly correlated in Bulgaria, Poland, Romania and Turkey. It has long been recognized that gross flows are much more volatile and are more relevant for macrofinancial implications than net flows. The reduction in gross capital inflows during a crisis is usually much larger than the decrease in net inflows (Broner et al., 2013). A focus just on net flows may hide the buildup of macrofinancial instabilities.

Between 2000 and 2008, all CESEE-12 countries except Russia were recipients of net capital flows, with the size of flows and the type of capital differing considerably across countries (chart A1). Irrespective of this pronounced heterogeneity of capital flows across countries, the overall nature and origins of the extraordinary influx were quite uniform. Some factors contributing to capital inflows were related to the particular conditions in most of the countries of the region, such as high returns on investment (low wages and low capital-to-labor ratios), the implementation of post-transition reforms (also in preparation of EU membership), improved legal certainty for foreign investors in connection with EU accession, or a comparatively low level of financial depth, which stimulated the demand for foreign investment in the domestic financial sector.⁶ Factors that were situated outside the region were the global search for yields in an environment of monetary accommodation in advanced economies alongside low volatility (the Great Moderation), investors' high expectations from integration with Western Europe, and the strategic positioning of foreign banks in CESEE, which increasingly boosted foreign financing intermediated by cross-border banking groups. This capital influx fueled an extraordinary credit boom (to some extent foreign currency lending), nurturing economic growth, a surge in asset prices and current account deficits. There is evidence that imbalances were more pronounced

⁵ We are using balance of payments data available from the IMF's International Financial Statistics (IFS) database according to the BPM6 (IMF, 2009) classification. Note that we cannot resort to pure gross flows, as they are not available in the database. Instead, we rely on a net recording concept (IMF, 2009), whereby debit entries are netted against credit entries. E.g. in the case of the net incurrence of portfolio investment liabilities, new bonds issued are netted against the redemption of bonds issued.

⁶ A lack of financial depth in CESEE was often used as an argument to justify skyrocketing private sector credit growth rates in 2005 to 2008 as deeper financial markets were expected to eventually benefit the economy (following the finance-led growth hypothesis, e.g. Levine, 1997). However, there were some indications already before the bust in 2007/08 (the Baltic countries) or in 2008/09, respectively, that a number of CESEE countries showed above-equilibrium credit growth rates (e.g. Égert et al., 2006) or that vulnerabilities in CESEE looked worse than in pre-crisis Asia (Bakker and Vladkova-Hollar, 2006).

in countries with fixed exchange rates (Bakker and Klingens, 2012). However, rather than stemming credit boom and capital inflow pressures, the exchange rate appreciation in a few countries with flexible exchange rates appears to have also fueled gross (bank) capital inflows, probably because local borrowers' balance sheets with loans denominated in foreign currency became stronger (Bruno and Shin, 2015).

When the global financial crisis hit, concerns were great that capital flow reversals would destabilize CESEE's financial system. In early 2008, the region saw a modest slowdown of *gross capital inflows* that translated into a broad reversal after the collapse of Lehman Brothers. The CESEE region shifted temporarily from a net borrowing to a net lending position in its financial account vis-à-vis the rest of the world. While the reversal occurred for most types of capital flows, it was most pronounced in other investments (currency and deposits). But between end-2009 and 2012, gross capital inflows recovered somewhat, largely reflecting portfolio inflows to some countries in the wake of monetary accommodation in advanced economies. The Vienna Initiative, which ensured that banks maintained an exposure to subsidiaries in CESEE, together with stabilization packages of international financial institutions and the EU, was also decisive in avoiding a sharp retrenchment in cross-border lending.

But gross capital inflows remained well below the pre-crisis levels during this period. Contrary to other emerging economies, the CESEE countries – with the exception of the Czech Republic, to some extent Poland, Slovakia and Turkey – did not see strong gross capital inflows as a share of GDP in the course of monetary accommodation in the U.S.A. and other advanced economies after late 2008. In 2011 and 2012, when countries in CESEE were increasingly confronted with contagion effects from the euro area sovereign debt crisis, gross capital inflows into the CESEE countries declined again, in particular in central Europe and Bulgaria (with the notable exception of Turkey). Following the Fed's tapering announcement in May 2013, cross-border bank lending to CESEE continued to decline, in particular in Poland, Turkey (see Eller et al., 2016a) and Russia (partly for geopolitical reasons). Since 2014, the CESEE countries, with the exception of Lithuania, Poland, Romania and Turkey, have seen a retrenchment of gross capital inflows; in some countries – Estonia, Hungary, Latvia, Romania, Russia, Slovakia and Slovenia – gross capital inflows have come to a halt, much like they did in 2009.

Cross-country differences are sizeable. Between 2000 and 2008, *Hungary* stands out for having accumulated the largest gross capital inflows in CESEE when measured as a percentage of its own GDP in 2000. Accumulated gross capital inflows amounted to 426% of domestic GDP in 2000 (chart 2). But unlike in other countries, most of the inflows stem from FDI (280% of 2000 GDP). Hungary was also one of the few countries that could attract more sizeable portfolio investment (47% of 2000 GDP). After a sharp retrenchment starting in 2009, gross capital inflows even turned negative in 2010/11, mainly reflecting stronger repayment than incurrence of FDI.

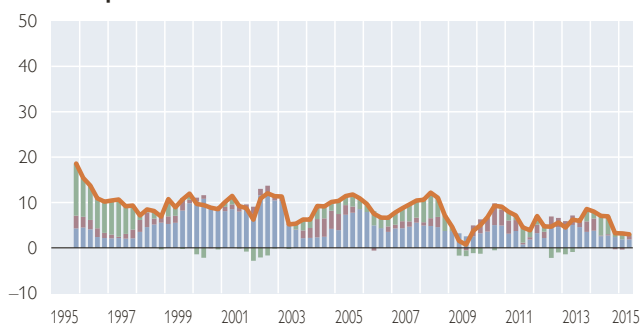
The *Baltic countries* also saw sizeable gross inflows, ranging between 207% (Lithuania) and 386% (Estonia) of 2000 GDP. A large part of these inflows reflected other investment (in particular, currency and deposits). FDI played a more dominant role only in Estonia. Net inflows were much lower during this period,

Gross capital inflows over time

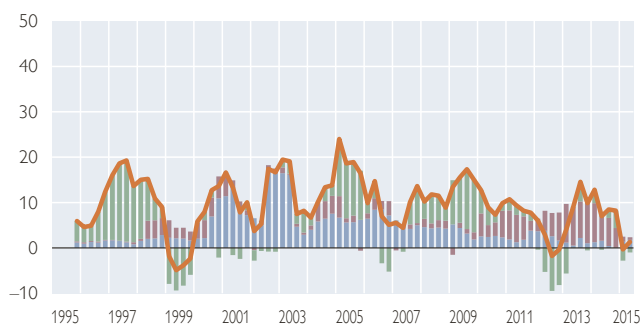
Net incurrence of FDI, PI and OI liabilities (incurrence less repayment)

% of GDP, cumulative four-quarter moving sums

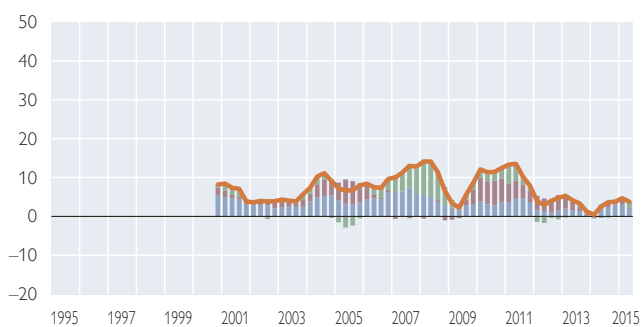
Czech Republic



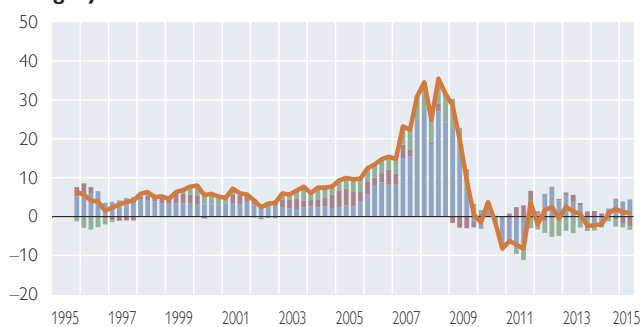
Slovakia



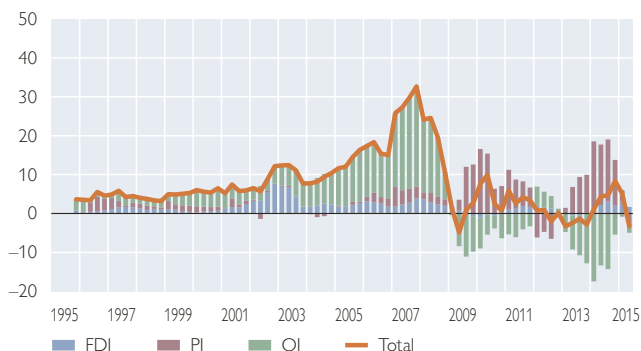
Poland



Hungary



Slovenia



■ FDI ■ PI ■ OI — Total

Source: IMF, Eurostat.

signifying that domestic agents also significantly increased their purchases of foreign assets. The severe recession starting in 2009 was accompanied by sizeable reversals of gross capital inflows, in particular of cross-border bank flows. In cumulative terms, between 2009 and the first half of 2015, gross capital inflows declined strongly to between 20% and 30% of 2009 GDP. In parallel, domestic agents increasingly started to invest in foreign assets. As a result, the Baltic countries saw a cumulative net outflow of capital ranging between 10% (Latvia) and 40% (Estonia).

Between 2000 and 2008, *Bulgaria* and *Romania* accumulated gross capital inflows of 357% and 231% of 2000 GDP, respectively. Both countries attracted FDI and other investment, but hardly any portfolio investment flows. After reversing

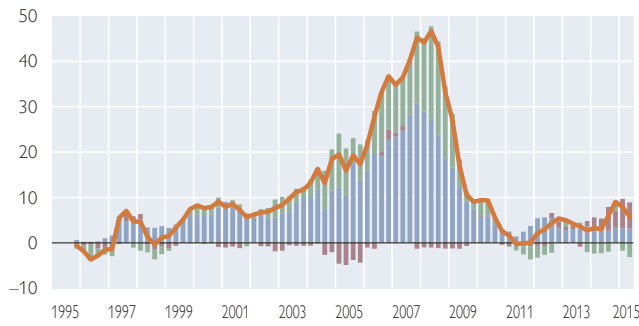
Chart 1 (continued)

Gross capital inflows over time

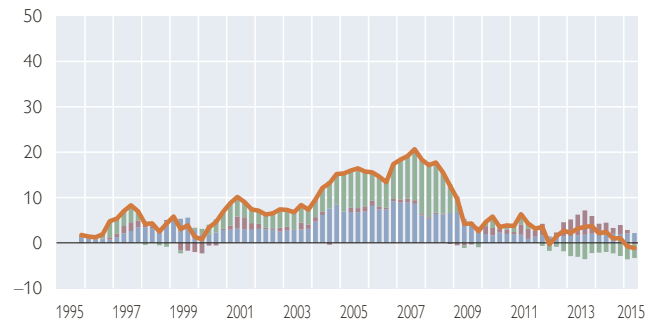
Net incurrence of FDI, PI and OI liabilities (incurrence less repayment)

% of GDP, cumulative four-quarter moving sums

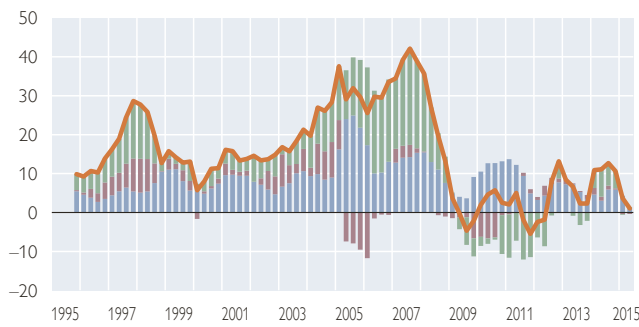
Bulgaria



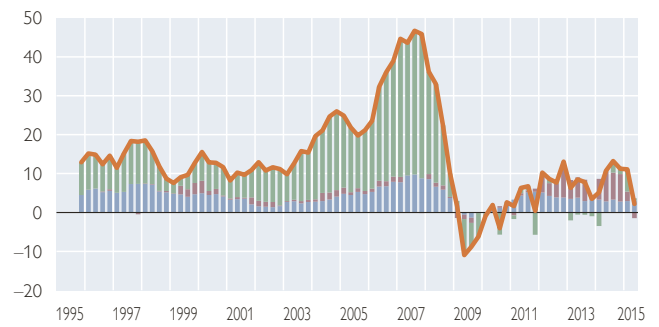
Romania



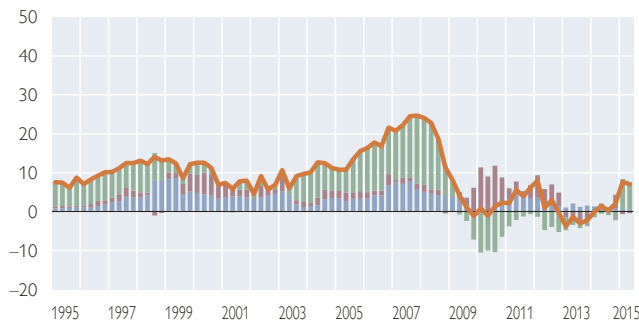
Estonia



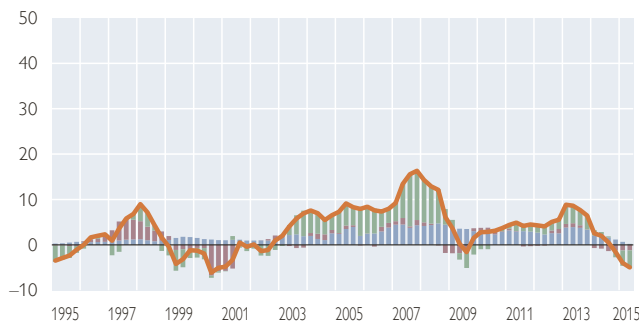
Latvia



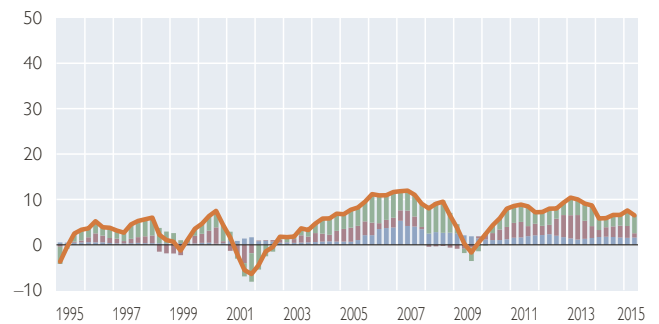
Lithuania



Russia



Turkey



■ FDI ■ PI ■ OI — Total

Source: IMF, Eurostat.

sharply following the crisis, gross capital inflows declined considerably. Both countries have not seen any sizeable gross capital outflows since 2000. Hence, the evolution of net and gross capital dynamics is quite similar. Like in Hungary, the capital flow cycle in Bulgaria was also driven predominantly by FDI inflows.

The influx of capital into the *Czech Republic*, *Slovakia* and *Slovenia* was more subdued than that into the Baltic countries, Bulgaria, Hungary and Romania, although it was still large compared to non-European emerging economies in this period (see Eller et al., 2016b). Gross capital inflows ranged between 135% (Czech Republic) to 176% of 2000 GDP (Slovakia). In a breakdown of capital flows, FDI predominated in the Czech Republic and Slovakia, while other investment inflows clearly dominated in Slovenia. While the Czech Republic and Slovakia saw a comparatively muted slowdown in gross capital inflows after the crisis hit, the drop in gross capital inflows – in particular bank loans – was especially severe in Slovenia. However, Slovenia and Slovakia succeeded in attracting considerable portfolio investment, which to some extent offset the strong decline in other investment.

Turkey saw total gross capital inflows of 67% of 2000 GDP until 2008; net inflows proved to be only marginally lower (50%). Gross inflows mostly comprised other investment and FDI. Gross (and net) capital inflows dropped considerably in 2009 but resurged thereafter. Turkey was able to keep the positive capital flow dynamics, attracting in particular other investment and portfolio investment until early 2013. However, after the Fed's tapering announcement in May 2013, portfolio investment inflows steadily declined, while inflows of loans largely kept their level.

Poland accumulated total gross capital inflows of 92% of 2000 GDP (net capital inflows of 63%) between 2000 and 2008, for the most part FDI. Poland is among the few CESEE-12 countries that received further sizeable gross capital inflows immediately after a temporary sharp slowdown of gross capital inflows in 2009. After 2011/12, Poland saw gross inflows continuously slowing down, mainly reflecting reversals of portfolio and other investment. From 2012 until the first half of 2015, Poland received some additional FDI inflows.

Russia's financial account followed a quite different pattern. Between 2000 and 2008, cumulative net capital inflows were negative (–27% of 2000 GDP), reflecting Russia's current account surplus position during this period. In the immediate aftermath of the 1998 Russian financial crisis, gross capital outflows outpaced inflows as a result of withdrawals by domestic and foreign agents. Starting in 2003, both gross inflows and outflows increased sizeably. When the financial crisis began in 2008, Russia experienced a short halt in gross capital inflows, brought about by negative portfolio and other investment gross inflows that were compensated by continuous gross inflows of FDI. In 2010, gross inflows started to recover, but by the end of 2010, they had started to decline again. The decline intensified after the outbreak of the Ukraine crisis at the end of 2013, and gross inflows became negative in the last quarter of 2014. In parallel, gross capital outflows were sizeable from 2011, but have slowed down in 2015.

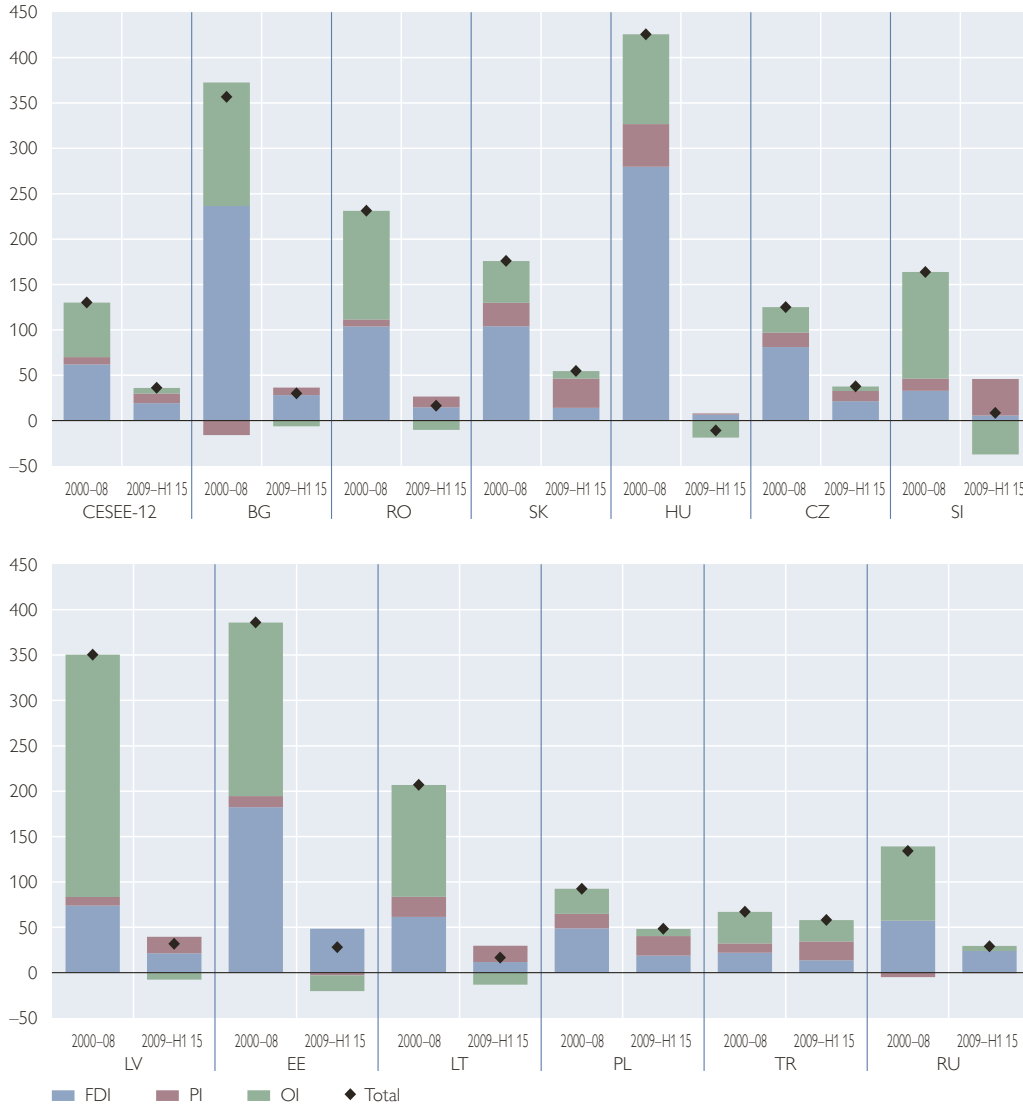
To sum up, prior to the 2008/09 crisis, gross capital inflows predominantly consisted of FDI (including stakes in financial firms) in a small number of countries, while they took the form of cross-border lending to banks and nonfinancial corporations, directly or via bank subsidiaries, in a large number of countries. A few countries, such as Poland, Slovakia, Slovenia or Turkey, also saw considerable portfolio inflows that remained sizeable in the immediate aftermath of the global

Chart 2

Gross capital inflows: 2000–08 versus 2009–15

Net incurrence of FDI, PI and OI liabilities (incurrence less repayment)

% of GDP in the first year of observation (2000 and 2009, respectively)



Source: IMF, Eurostat.

financial crisis, when foreign investors searched for yields in a low-interest global environment. While in the years immediately after 2008, CESEE could still attract gross FDI inflows, albeit declining ones, cross-border credit inflows (including remittances) dropped substantially. Since 2014, the amount of gross capital leaving CESEE has been larger than gross capital inflows.

2 Econometric framework

To explore the relationship between capital flow dynamics in CESEE and global factors, we use a time-varying parameter dynamic factor model with stochastic volatility building on Pitt and Shephard (1999), Aguilar and West (2000), and Del

Negro and Otrok (2008). In the following subsection, we provide a brief overview of the model along with a sketch of the estimation method employed.

2.1 The time-varying parameter dynamic factor model

We assume that a large set of macroeconomic and financial variables in a panel of economies is driven by a set of relatively few latent factors. Moreover, we assume that capital flows into country i ($i = 1, \dots, N$), C_{it} may be described by the following simple dynamic regression model:

$$C_{it} = \lambda'_{Mt,t} f_t^M + \lambda'_{Ft,t} f_t^F + \lambda'_{Ct,t} f_t^C + \lambda'_{Rt,t} f_t^R + \varepsilon_{it}, \quad (1)$$

where

- $\lambda'_{jt,t}$ for $j \in A = \{M, F, C, R\}$ are time-varying factor loading matrices of dimension $1 \times k_j$ that evolve as an independent random walk process, i.e. $\lambda_{jt,t} = \lambda_{jt,t-1} + \eta_{jt,t}$ is a vector white-noise innovation with variance-covariance matrix V_{jt} , which is a full positive definite matrix;
- f_t^j are mutually orthogonal latent factors of dimension k_j that capture the prevailing global co-movement of macroeconomic variables (M), financial variables (F) and the respective capital flow variable under investigation (C). In addition to these global factors, we also include a regional capital flow factor (R) to capture the notion that capital movements display strong regional tendencies. We assume that these factors follow AR(1) processes, $f_t^j = \Phi_j f_{t-1}^j + e_t$, with $e_t \sim N(0, \text{diag}(e^{h_{M,t}}, \dots, e^{h_{R,t}}))$ and Φ_j being a diagonal matrix with typical element $\phi_{jt} \in (-1, 1)$ to ensure stationarity;
- $\varepsilon_{it} \sim N(0, e^{s_{it}})$ is a white-noise idiosyncratic error with time-varying variance $e^{s_{it}}$. As a residual, it captures everything that has not explicitly been considered in the model, such as country-specific factors or other global and regional driving forces;
- s_{jt} and $h_{kj,t}$ are log volatilities that follow autoregressive processes of order one.

Equation (1) denotes the observation equation of the model. The law of motions for the log volatilities, the loadings and the latent factors are assumed to be stationary AR(1) processes or random walks.

For the different types of latent factors, we simply assume that different variables are included for each variable type (i.e. global macroeconomic, global financial, global capital and regional capital variables). To give an intuitive example, the group of macroeconomic variables includes GDP growth. A single latent factor is extracted from each country's GDP growth series. This factor captures the common movement of output growth across all the economies considered and can be interpreted as a global real business cycle.⁷ The extraction procedure is repeated for all quantities included (see table 2). For the sake of exposition, we then group the different factors into the four categories of variables mentioned above. Recall that in the case of factors capturing common capital flow movements, we extract a single global and a single regional factor from the capital flow series under investigation and include it in the model.

⁷ Likewise, the same procedure is repeated for the change in equity prices, capturing the common component of equity prices returns along with the corresponding stochastic volatility component. This also allows us to endogenously construct a measure of global equity price volatility similar to the volatility index (VIX) of the Chicago Board Options Exchange.

The assumption that the error variances of both the observation and the state equations are allowed to vary over time is crucial for mimicking the dynamic properties of the capital flow quantities under consideration. Moreover, permitting this variation also allows us to investigate later on whether global driving forces of country-specific capital flows have changed over time. In addition, time-varying factor loadings allow us to capture the notion that the relationship between capital flows in a given country and global driving forces changes over time. Choosing this approach proves to be important in the light of the recent global financial crisis, where a U.S.-based shock spread globally and the prevailing co-movement between financial markets increased considerably.

As emphasized above, we assume that the factors are orthogonal to each other, implying that the variance of each C_{it} is given by

$$Var(C_{it}) = \sum_{j \in A} \lambda'_{ji,t} Var(f_t^j) \lambda_{ji,t} + Var(\varepsilon_{it}), \quad (2)$$

which permits us to compute the relative contribution of a given factor in explaining the variance of C_{it} .

2.2 Priors and estimation

Our approach to estimation and inference is Bayesian. We thus impose a set of diffuse standard priors on the coefficients of the model. For the initial state of the loadings $\lambda'_{ji,t}$, we impose a normally distributed prior with mean zero and a prior variance set equal to 4, which is thus rather noninformative on the initial state of the coefficients. Higher values lead to qualitatively similar results, while lower values tend to shrink the initial value of the coefficients strongly toward zero, implying that global factors were relatively unimportant at the beginning of the sample. For the variance-covariance matrix of the factor loadings, we impose an inverted Wishart prior, with the prior scale matrix set equal to a diagonal matrix with 0.1 on its main diagonal. The degrees of freedom are set such that the prior is proper (i.e. set equal to the number of free elements in the state vector plus one). The specific choice of the scaling matrix tends to be quite influential for the final estimates. However, in our application, the specific choice of the scaling matrix proves to be relatively unimportant, as long as it is not set to a matrix too close to the zero matrix. Furthermore, we impose the same set of priors on the state equation of the log volatilities as described in Kastner and Frühwirth-Schnatter (2014).

Our Markov chain Monte Carlo (MCMC) scheme simulates the full history of the factor loadings with the algorithm described in Carter and Kohn (1994) and Frühwirth-Schnatter (1994). With the loadings known, the state variance-covariance matrices can be sampled from an inverted Wishart distribution that takes a standard form. The diagonal elements of Φ_j are simulated through a simple Gibbs step where we impose the condition $|\phi_{ii}| < 1$. The stochastic volatility components are simulated by means of the algorithm proposed in Kastner and Frühwirth-Schnatter (2014). Finally, we do not simulate the latent factors, but approximate them through their principal components. As opposed to a fully fledged simulation approach, this choice proves to be necessary because our full data matrix consists of over 390 time series, which renders simulation-based methods infeasible. Our MCMC algorithm is repeated 20,000 times, with the first 10,000 draws from the joint posterior being discarded as burn-in.

3 Data preparation for estimation

We use the dataset described in Eller et al. (2016b), which consists of quarterly data from Q1 94 until Q4 14 for a worldwide sample of 39 countries, and include a total of ten macroeconomic and financial time series for each country (see tables 1 and 2 listing the countries, variables and data sources). This choice of variables closely resembles the typical set of macroeconomic and financial quantities included in the literature on global macroeconomic modeling (see, for instance, Feldkircher and Huber, 2016; Crespo Cuaresma et al., 2016) augmented with a set of additional explanatory variables that were previously identified to be important determinants of capital flows (e.g. Milesi-Ferretti and Tille, 2011; IMF, 2014; Mishra et al., 2014; Olaberria, 2014). Using a broad sample of countries allows us

to track economic spillovers that might influence the intensity of capital inflows. As opposed to the literature on modeling capital flows by means of gravity equations (e.g. Portes et al., 2001; Portes and Rey, 2005), we do not aim to explain bilateral movements in capital flows but focus on ex-

Table 1

Country coverage

CESEE (12): BG, CZ, EE, HU, LT, LV, PL, RO, RU, SI, SK, TR
 Advanced Europe (12): AT, DE, DK, ES, FI, FR, GB, IT, NL, NO, PT, SE
 Advanced non-Europe (6): AU, CA, JP, NZ, US, ZA
 Latin America (5): AR, BR, CL, MX, PE
 Asia (4): ID, KR, PH, TH

Source: Authors' compilations.

Note: Abbreviations represent the two-digit ISO country code.

Table 2

Variable description

Variable type	Variable	Description
Macro	GDP growth	GDP volume, 2010=100, seasonally adjusted, in logarithms, quarter-on-quarter change
Macro	Inflation rate	(Harmonized) consumer price index, 2010=100, seasonally adjusted, quarter-on-quarter change
Macro	REER change	Real effective exchange rate, CPI-based index, seasonally adjusted, in logarithms, quarter-on-quarter change
Macro	Trade balance change	Exports over imports of goods and services, CPI deflated, seasonally adjusted, in logarithms, quarter-on-quarter change
Financial	Short-term interest rate	Typically, three-month money market rate (per annum)
Financial	Long-term interest rate	Typically, yield on ten-year government bonds (per annum)
Financial	Equity price growth	Equity price index, 2005=100, seasonally adjusted, in logarithms, quarter-on-quarter change
Financial	Credit growth	Claims on domestic private sector, CPI deflated, seasonally adjusted, in logarithms, quarter-on-quarter change
Financial	Deposit growth	Deposits of domestic private sector, CPI deflated, seasonally adjusted, in logarithms, quarter-on-quarter change
Capital	Capital flows	Cumulative four-quarter moving sums of gross direct investment, portfolio investment and other investment inflows in U.S. dollars as a percentage of nominal GDP (transformed into U.S. dollars by using the average quarterly rate of the local currency per U.S. dollar)

Source: Authors' compilations. Data are taken primarily from the IMF's International Financial Statistics (IFS) database but also from the OECD, ECB, Eurostat and Thomson Reuters.

Note: Seasonal adjustment was conducted by using the difference from the moving average. If the short-term (long-term) interest rate was not available, we used the dynamics of the deposit (lending) rate for data interpolation. In the case of few missing observations at the beginning or the end of the sample, we used the average of the subsequent or previous four quarters to fill these gaps. For more details, see Eller et al. (2016b).

plaining the variation of different types of capital inflows by means of global fundamental factors.

4 Empirical findings

While the descriptive part (section 1) stressed both gross and net flows, in this section we exclusively present our results for an empirical proxy for gross capital inflows, i.e. the net incurrence (incurrence less repayment) of financial liabilities. Our main analytical interest lies in gaining a better understanding of the driving forces of volatile *gross* capital inflows, in line with the observation that during a situation of elevated global macrofinancial risk, foreign investors are likely to downsize their investment in markets they perceive as particularly risky (IMF, 2013).

Chart 3 shows the variance decomposition results for incurrence less repayment of totaled direct, portfolio and other investment liabilities over time for nine individual CESEE countries and for the Baltic countries as a group. The time-varying, standardized volatility of the respective capital flow series is depicted as a dark line (right-hand side scale) in each panel. Global or regional economic and financial crises are readily visible in the increasing volatility of gross capital inflows, in particular in the run-up to the global financial crisis in 2008/09. The sudden stop is followed by an abrupt decline in the volatility measure. Russia and Turkey stand out, as they experienced additional financial crises (Russia: 1998/99, Turkey: 2001). These crisis periods, together with the retrenchment of gross capital inflows in Russia and to some extent in Turkey and Poland since 2013, are visible in a rise in the volatility measure. In the case of Russia, the volatility of capital inflows strongly increased after 2013 to a level similar to that observed in 2008/09.

A common feature of all country groups is that they received – to varying degrees – sizeable and accelerating gross capital inflows after 2003; these inflows collapsed in 2009 (section 1). What were the drivers of gross capital inflow dynamics into the CESEE countries? Chart 3 and table A1 show the relative variance contribution of the extracted factors:

In all countries under consideration, the lion's share of the variance of gross capital inflows (FDI, portfolio investment and other investment) in the period between 1994 and 2014⁸ is explained by the contribution of the three extracted global factor components together with one regional capital factor, ranging – on average across time – from 70% in the Czech Republic to about 85% in Bulgaria, Hungary, Latvia and Romania. Recall that the global factors comprise (1) a real business cycle component (capturing four global macroeconomic factors), (2) a financial cycle component (capturing five global financial factors), and (3) one global capital factor (see section 2).

Disentangling the real business component from the financial cycle component allows us to better understand whether capital inflows are driven more, for instance, by global economic growth, or whether they are related more to a global deleveraging shock, to give another example. It is striking that the global financial cycle has the strongest explanatory power. On average, across time and across the CESEE-12, it explains more than 40% of the variance of gross capital inflows (ranging from about 35% in the Czech Republic to more than 60% in Estonia),

⁸ For Poland, no quarterly data on capital flows are available for the period prior to 2000.

followed by the global real business cycle component with an average explanatory power of 22% (ranging from 12% in Estonia to about 30% in Bulgaria, the Czech Republic and Turkey).

The global capital factor measures co-movements of capital inflow variables across all 39 countries and illustrates their relevance for capital flow dynamics in the respective country. The contribution of the global capital factor to the variance of capital flow volatility in all CESEE countries turns out to be quite small (just under 6% on average). The regional capital factor that measures the co-movement of capital inflows into CESEE and their contribution to capital flow volatility in the respective CESEE countries is apparently more important (with an average explanatory power of 10%) than the global capital factor in most countries (except in Poland and Turkey), suggesting that these countries are apparently more strongly linked to a regional capital flow cycle than to a global one.

Some differences across countries and over time stand out:

Looking at the time-varying pattern, the countries that exhibited the largest gross capital inflows relative to GDP in the pre-crisis boom period between 2003 and 2008 (the Baltic countries, Bulgaria, Hungary, Romania, Russia and Slovenia) saw a temporary and to some extent significant decline of the capital flow variance share explained by global factors during this period and, as a mirror image, a rise in the idiosyncratic factor. Recall that the idiosyncratic factor characterizes everything that cannot be explained by the extracted factors, i.e. country-specific macroeconomic and/or financial factors, but also other global and regional factors not explicitly accounted for in our model. This means that the extraordinary capital influx during the 2003 to 2008 period was too excessive just to be predominantly explained by the previous constant and high share of common global push factors included in the model. Apparently, the capital inflows were increasingly driven during this period by country-specific phenomena or by factors situated outside the region, such as the strategic positioning of foreign banks in CESEE. Note that in the literature, cross-border banking flows channeling funds to emerging markets are considered a decisive global “supply push” factor (Bruno and Shin, 2015), contrary to the local “demand pull” factors, i.e. factors that are specific to countries themselves. How does this explanation square with our empirical findings? The fact that the explanatory power of the idiosyncratic factor increases temporarily (mostly at the expense of the global financial cycle) during the capital inflow boom between 2003 and 2008 does not mean that “supply push” factors declined. We interpret this result as follows: In the respective countries, capital inflows far exceeded the level explainable by the global common factors, in particular the global financial factor, leading to a relative rise in the unexplained part of the model. According to Eller et al. (2016b), this phenomenon was also observable in the countries in advanced Europe that accumulated sizeable gross capital inflows between 2003 and 2008, but not in other regions of the world.

After the retrenchment of gross capital inflows in 2009, the explanatory power of the global factors picks up again and reaches unprecedented heights in several countries where capital inflows were strong from 2003 to 2008. To give an example, the variance share explained by reasons other than idiosyncratic factors rises from an average of 67% in the period from 2001 to 2008 to 94% in the period from 2009 to 2014 in Romania, or from 66% to 86% in Lithuania (see table A1). The increase in the explanatory power of the global factors was more muted and grad-

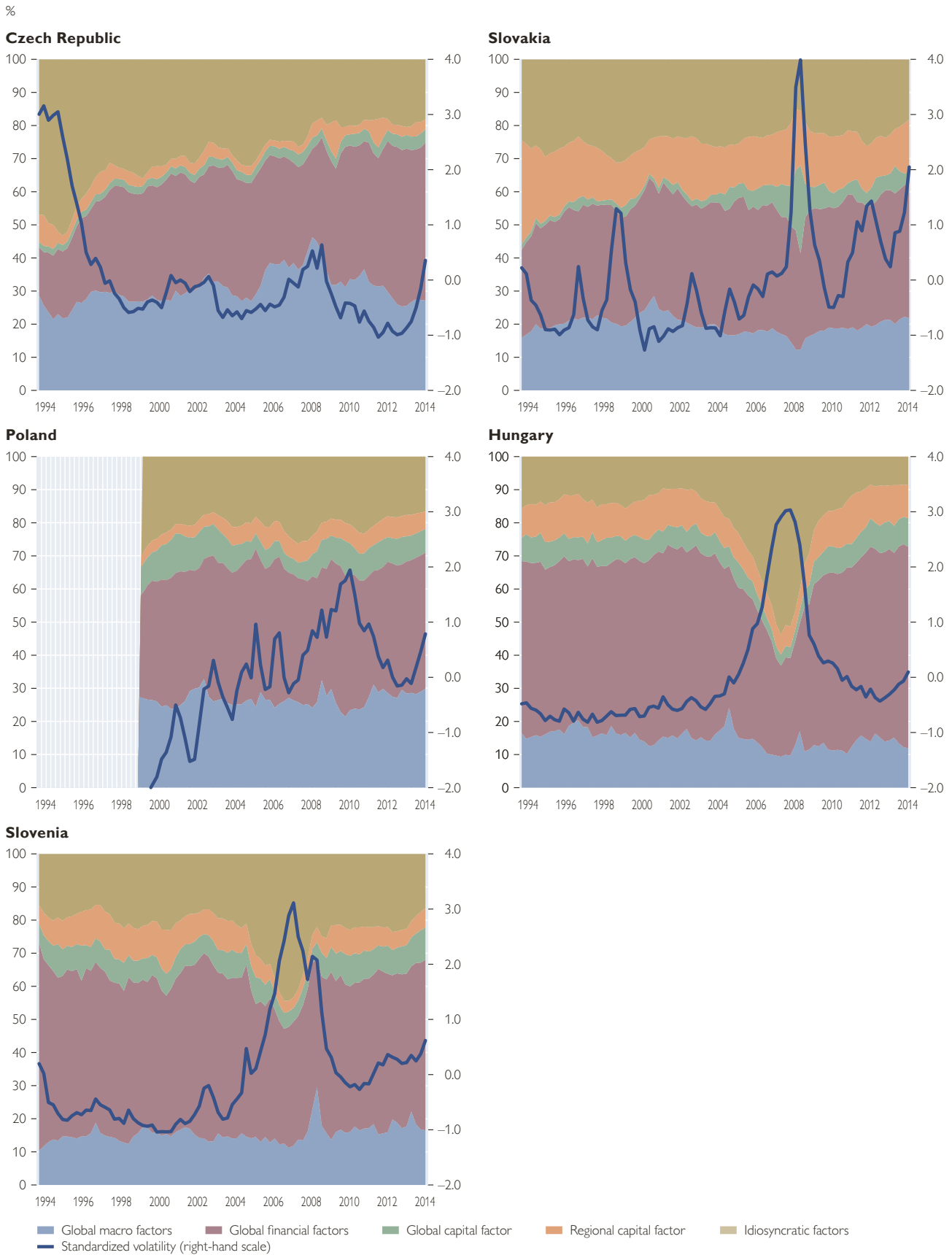
ual in the case of the Czech Republic, Poland, Slovakia and Turkey. In particular, the variance share explained by global financial factors rose after the global financial crisis hit, widening from a CESEE-12 average of 40% (2001 to 2008) to 46% (2009 to 2014). This may well reflect the global deleveraging shock and the associated retrenchment in gross capital inflows as well as the impact of monetary accommodation in advanced economies that might have partly offset capital flow reversals. Global financial factors may also reflect the impact of the Fed's tapering announcement in May 2013, which affected above all Poland and Turkey, and, to a much smaller degree, the other CESEE countries (see Eller et al., 2016a).

Given that different types of gross capital inflows had different dynamics before and after the global financial crisis (recall section 1), we summarize in table A1 the variance decomposition results for each country and for each capital flow type (FDI, portfolio investment and other investment) across three distinct sub-periods. While most of the previously discussed results for the total capital inflows variable also hold for its components, a few differences stand out. First, global factors are considerably less important in explaining the variance of portfolio investment inflows (on average, across time and across the CESEE-12, about 70%) than that of FDI (82%) or other investment inflows (80%). Second, the variance share explained by global factors stays rather constant or strengthens only gradually over time in the case of portfolio investment inflows, whereas for FDI and other investment inflows, we can confirm that the global factors lose remarkable importance during the pre-crisis boom period but gain substantial significance in the post-crisis period. Third, global financial factors are less important in explaining the volatility of portfolio investment inflows than that of FDI and other investment inflows (with an average share for the whole sample of 32% in the case of portfolio investment compared with nearly 40% in the case of the two other investment categories). Global macroeconomic factors, in contrast, show a fairly similar explanatory power across all the three types of capital inflows. Overall, these disaggregated results suggest that global factors are comparatively less important for portfolio investment inflows in CESEE (with the exception of the pre-crisis boom period). In other words, country-specific particularities detached from global (financial) cycles have still considerable weight for international portfolio investors, reflecting for instance their willingness to quickly shift money to those countries which offer higher yields.

Finally, to shed some light on the reasons for the cross-country heterogeneity observed in our variance decomposition results, we investigate to which extent the share of the variance of total capital inflows explained by common global and regional factors is related to country-specific macrofinancial variables (in the spirit of Kose et al., 2003, or Förster et al., 2014).⁹ One could, for instance, argue that more flexible exchange rates, higher foreign exchange reserves, lower public or external debt or deeper financial markets with more capacity to absorb capital inflows reduce the share of variance of capital inflows that is explained by common global factors, as suggested by recent empirical evidence provided by the IMF (2016) for a large sample of worldwide emerging markets. Or, to put this view

⁹ Obviously, such an analysis raises the question of variable selection, i.e. which macrofinancial fundamentals are the most important ones in the light of economic theory and/or existing empirical evidence. A respective multivariate panel or cross-section analysis with a large-scale set of explanatory variables would be beyond the scope of the present paper. We thus leave it for future research.

Variance decomposition of gross capital inflows over time



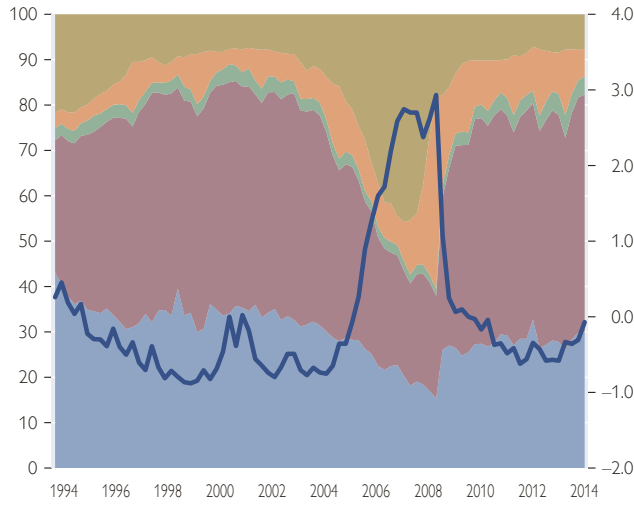
Source: Authors' estimates.
 Note: Variables whose variance is explained: incurrence less repayment of totaled direct, portfolio and other investment liabilities as a share of GDP, cumulative four-quarter sums.
 Results for Poland are based on estimations for the period from Q1 00 to Q4 14, given missing data for Poland in the 1990s.

Chart 3 (continued)

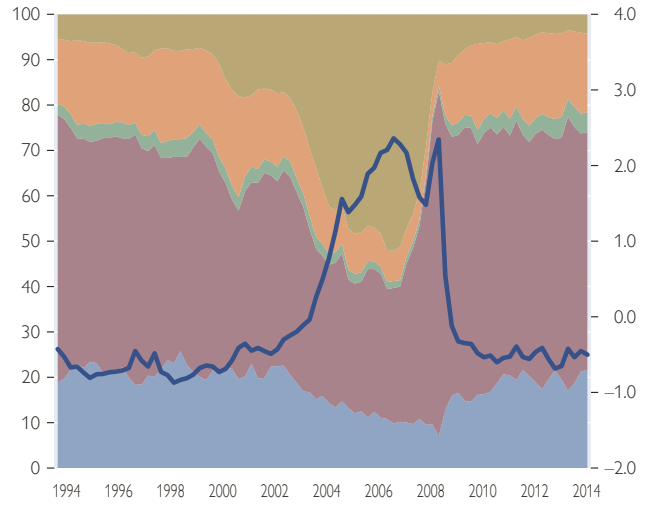
Variance decomposition of gross capital inflows over time

%

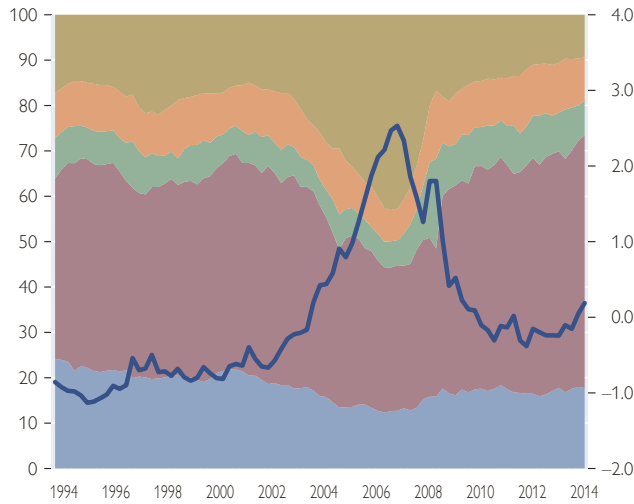
Bulgaria



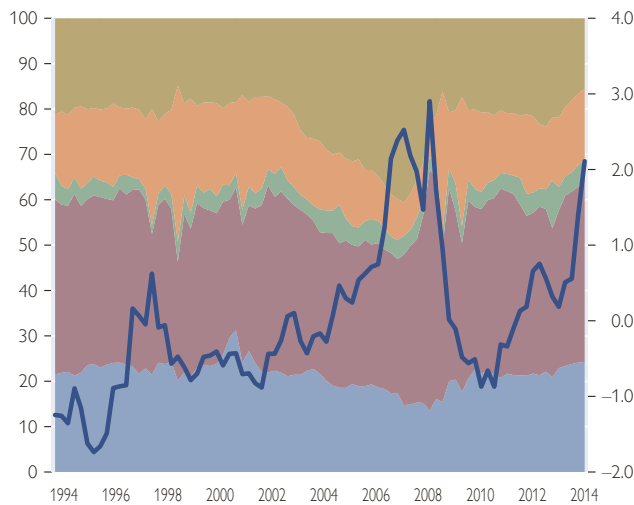
Romania



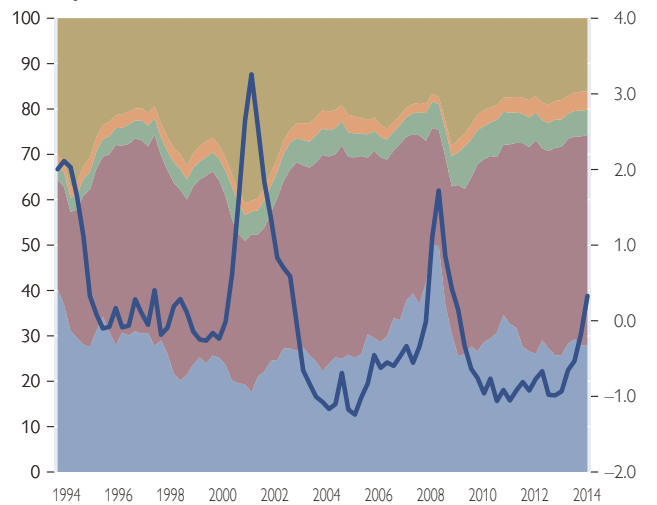
Baltic countries



Russia



Turkey



■ Global macro factors
 ■ Global financial factors
 ■ Global capital factor
 ■ Regional capital factor
 ■ Idiosyncratic factors
— Standardized volatility (right-hand scale)

Source: Authors' estimates.

Note: Variables whose variance is explained: incurrence less repayment of totaled direct, portfolio and other investment liabilities as a share of GDP, cumulative four-quarter sums. Unweighted cross-country averages are shown for the three Baltic countries.

differently, the sounder domestic macrofinancial fundamentals are, the less susceptible economies are to fluctuations in global business or global financial cycles. However, for our sample we do not find any considerable correlation between the variance share explained by nonidiosyncratic factors on the one hand and the level of foreign exchange reserves, the degree of exchange rate and output volatility, the levels of public and external debt and the level of financial sector depth on the other hand (based on unconditional bivariate correlations, which are available from the authors upon request). If anything, there is some indication that a higher level of foreign exchange reserves is associated with a lower capital flow variance share explained by global financial factors. We also examined these correlations across different subperiods, which does not, however, render more systematic relationships. This preliminary evidence suggests that focusing only on sound macrofinancial fundamentals is apparently not enough to shelter CESEE economies from spillovers of global cyclical fluctuations.

5 Policy implications

Our results highlight the important role of global (financial) factors determining boom and bust cycles of gross capital flows into CESEE. A large share of global push factors does not necessarily underpin the need to directly or indirectly control capital flows. Recommendations to restrict the capital account are justified only after carefully weighing potential benefits,¹⁰ such as improved allocative efficiency and better risk sharing against the costs of financial openness. These costs involve financial instability as well as a loss of the room for maneuver in autonomous monetary policy, also for economies with flexible exchange rate regimes. A concise cost-benefit analysis is beyond the scope of the paper. But it has to be acknowledged that capital flows into CESEE that largely took the form of FDI and cross-border bank loans have undoubtedly facilitated the catching-up process. At the same time, capital inflows were not effectively absorbed and sufficiently channeled toward productive investment. Very often, they boosted house price booms and a credit cycle – in many countries denominated in foreign currency – that collapsed in the course of the crisis.

In principle, the following options are available to weaken potential spillovers from the global financial cycle (Rey, 2015): (1) One could impose direct capital controls. With a few exemptions, such restrictions are prohibited by EU law, however.¹¹ (2) Another policy option would be to have the central banks of large countries internalize the spillover effects of their monetary policies onto other countries. International coordination in this field is discouraged because it would involve complex tradeoffs when conflicts arise with the domestic mandates of large countries' central banks. Since at least for the EU countries, the first option is ruled out and at the current juncture, the second option is not implementable, negative spillover effects could be directly addressed by (3) macroprudential mea-

¹⁰ Some papers point toward the existence of threshold effects: Financial openness is beneficial only after a country has reached a certain level of institutional or financial sector development (Bekaert et al., 2013; Kose et al., 2011).

¹¹ The provisions of the Treaty on the Functioning of the European Union (TFEU) allow capital movements to be restricted only under specific conditions, including national measures to prevent infringements of national laws, regulations on taxation and prudential supervision of financial institutions, and measures justified on grounds of public policy or public security (Article 65(1)(b)). However, these measures must not represent a means of arbitrary discrimination or a distinguished restriction in the sense of Art. 65(3) TFEU.

asures that, above all, limit excessive credit growth and related financial stability risks. Available instruments include countercyclical capital buffers; leverage, loan-to-value (LTV), debt-to-income (DTI) and debt service-to-income (DSTI) ratios; restrictions on foreign currency lending; and levies on noncore bank (foreign exchange) liabilities that represent wholesale funding. Some of these tools overlap with capital flow management instruments, e.g. a levy on bank foreign exchange inflows that is meant to limit capital inflows as well as to reduce systemic financial risk (IMF, 2012). Some CESEE countries already implemented a few of these macroprudential tools before the 2008/09 crisis to tame skyrocketing private sector credit growth.¹² A combination of different macroprudential instruments might be necessary to prevent circumvention. Moreover, reciprocity agreements with capital flow-sending countries are crucial to prevent such measures from being undermined by cross-border lending. After all, preventing excessive cross-border lending is also in the macrofinancial interest of source countries. Macroprudential measures can be viable substitutes for capital controls and for better international monetary policy coordination, which seems to be out of reach at the current juncture. Making the domestic financial system more resilient to a reversal of capital flows via capital and liquidity regulation could complement macroprudential regulation. It follows that macroprudential policies that may, in some cases, overlap with capital flow management measures probably provide the most promising tools to avoid boom-bust cycles in capital flows, dampening excessive inflows during good times and, at least to some extent, containing outflows during crises.

6 Conclusions

Before the global financial crisis hit, the CESEE countries attracted sizeable gross capital inflows. At a global scale, only advanced European countries received higher cumulative inflows in the period from 2003 to 2008. However, cumulative net capital inflows into the CESEE countries as a percentage of GDP were by far the highest worldwide and outstripped the flows that poured into East Asia before the Asian crisis hit in the late 1990s. After a sharp capital flow reversal in 2009, only a few CESEE countries received sizeable gross capital inflows, albeit short-lived ones. What was driving this extraordinary boom-bust episode in capital inflows? Were inflows related to global, regional or country-specific factors? Were there differences across countries and categories of capital flows?

We make use of a time-varying parameter factor model with stochastic volatility that allows us to disentangle five different determining factors: a global real business component, a global financial component, a global capital, a regional capital as well as an idiosyncratic component. The latter captures country-specific or other elements that are not part of the model. Most strikingly, on average, the global factors, particularly the global financial factors, have the strongest power in explaining volatility in gross capital inflows. This holds for all CESEE countries.

Differences emerge with respect to capital flow dynamics across time and their explanatory factors. The years of the run-up to the crisis are usually seen as the period of the Great Leveraging, during which abundant liquidity was transmitted across the globe, predominantly via bank lending. Between 2003 and 2008, one

¹² Gersl and Jasova (2014) found that during the 2003 to 2007 period, provisioning rules and limits on LTV and/or DSTI ratios contributed to decreasing credit growth in several CESEE economies.

group of countries (the Baltic countries, Bulgaria, Hungary, Romania, Russia and Slovenia) saw sizeable gross (and net) capital inflows and a sharp retrenchment of capital flows when the crisis hit. In the other CESEE-12 countries, the boom-bust cycle was also strong but less pronounced. We show that during this period of excessive gross capital inflows that consisted to a large extent of cross-border loans and FDI, the idiosyncratic factor increased temporarily at the expense of the global factors in the first group of countries. Thus, the extraordinary capital influx from 2003 to 2008 was apparently too excessive in these countries to be predominantly explained just by the previous constant and high share of common global factors accounted for in the model. One reason for this increasing unexplained part of the variance could be the strategic positioning of Western banks in the CESEE. These banks' investments and funding activities between 2003 and 2008 were so sizeable that they can only partly be explained by common global (financial) factors. Note, however, that during this period, the global factors still explain more than half of the variance of gross capital inflows. Interestingly, after the crisis hit, the global factors rise again – reaching unprecedented levels in some countries.

These findings have a bearing on the ongoing debate on how to deal with volatile capital flows. To the extent that capital flow volatility is mainly driven by global factors, instruments that limit potential negative spillovers from global cyclical fluctuations and thus smooth the domestic capital flow cycle are warranted. They certainly involve, above all, better international policy coordination and macroprudential measures. More research is thus called for on the potential of different types of macroprudential measures to shield countries from globally determined capital flow volatility.

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Annex

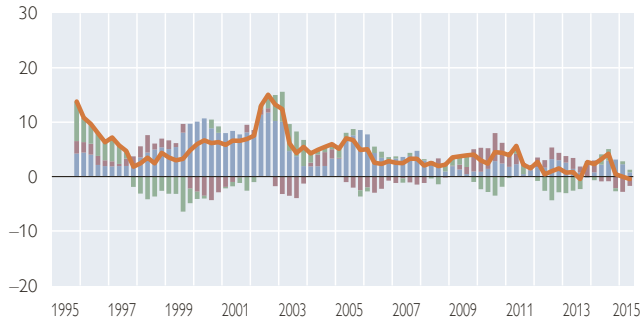
Chart A1

Net capital flows over time

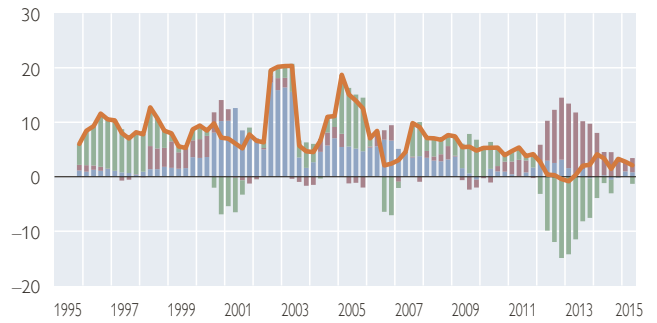
Net FDI, PI and OI liabilities (net incurrence of liabilities less net acquisition of assets)

% of GDP, cumulative four-quarter moving sums

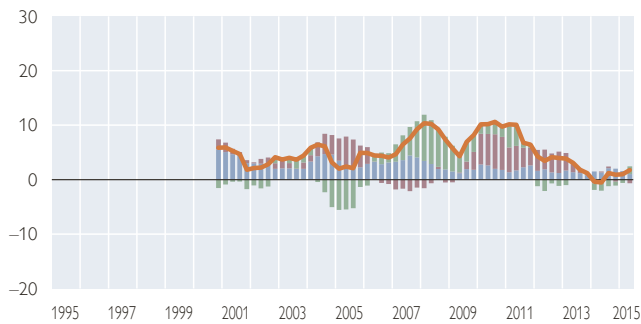
Czech Republic



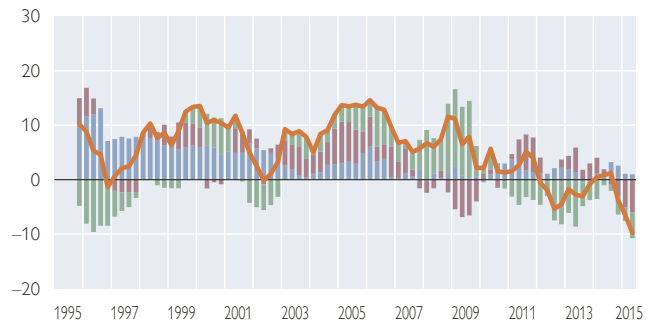
Slovakia



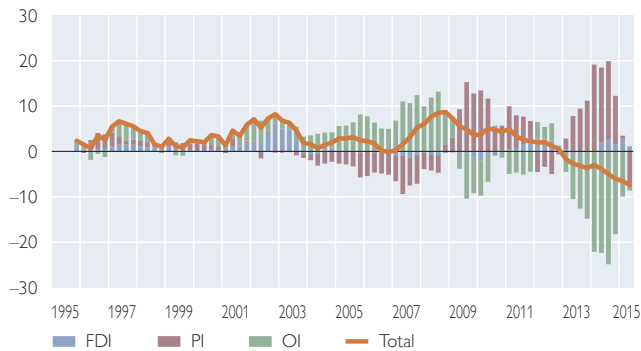
Poland



Hungary



Slovenia



■ FDI ■ PI ■ OI — Total

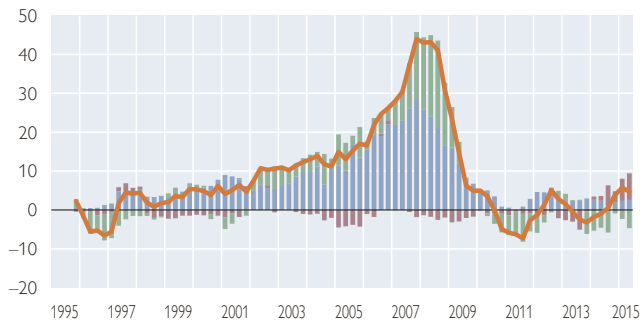
Source: IMF, Eurostat.

Net capital flows over time

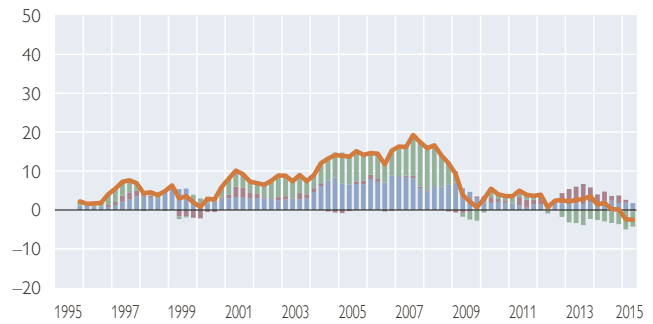
Net FDI, PI and OI liabilities (net incurrence of liabilities less net acquisition of assets)

% of GDP, cumulative four-quarter moving sums

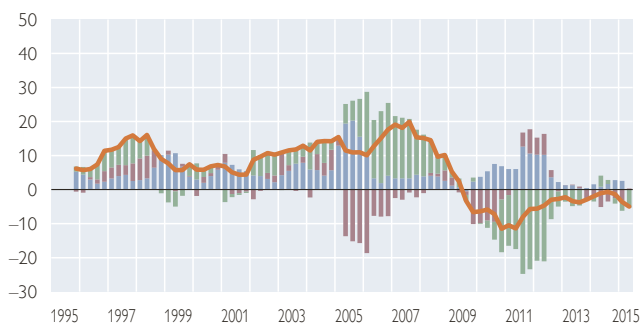
Bulgaria



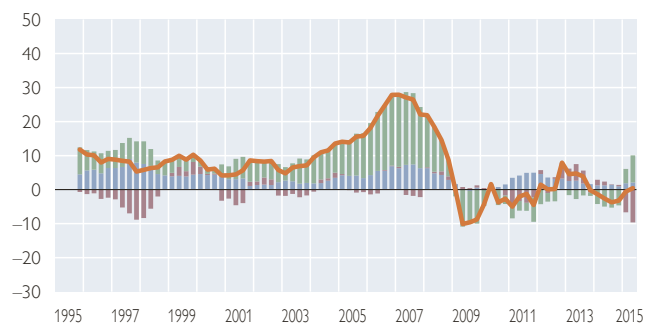
Romania



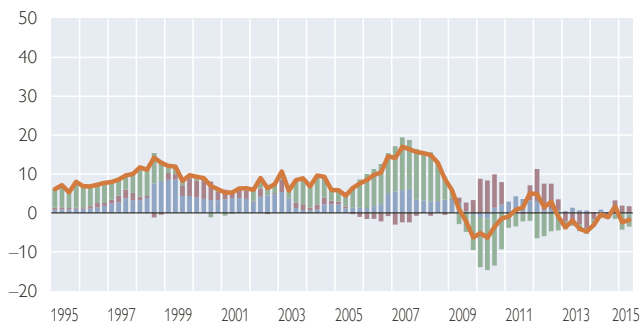
Estonia



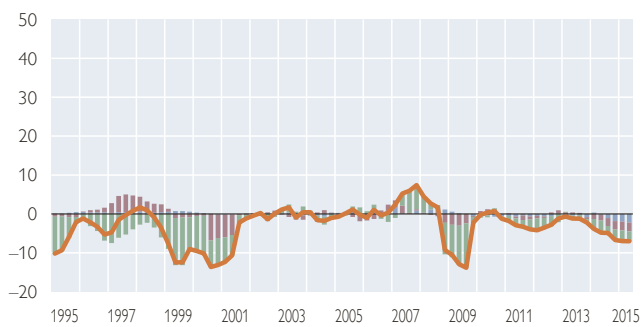
Latvia



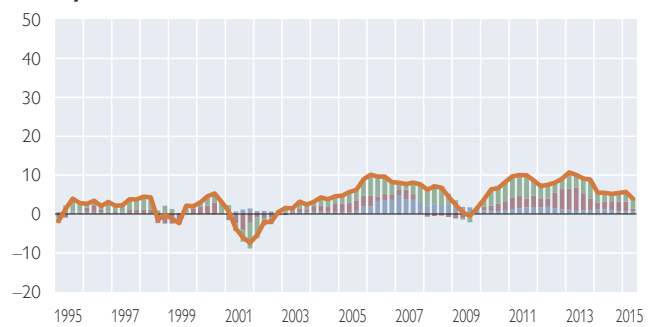
Lithuania



Russia



Turkey



Legend: FDI (blue bars), PI (purple bars), OI (green bars), Total (orange line)

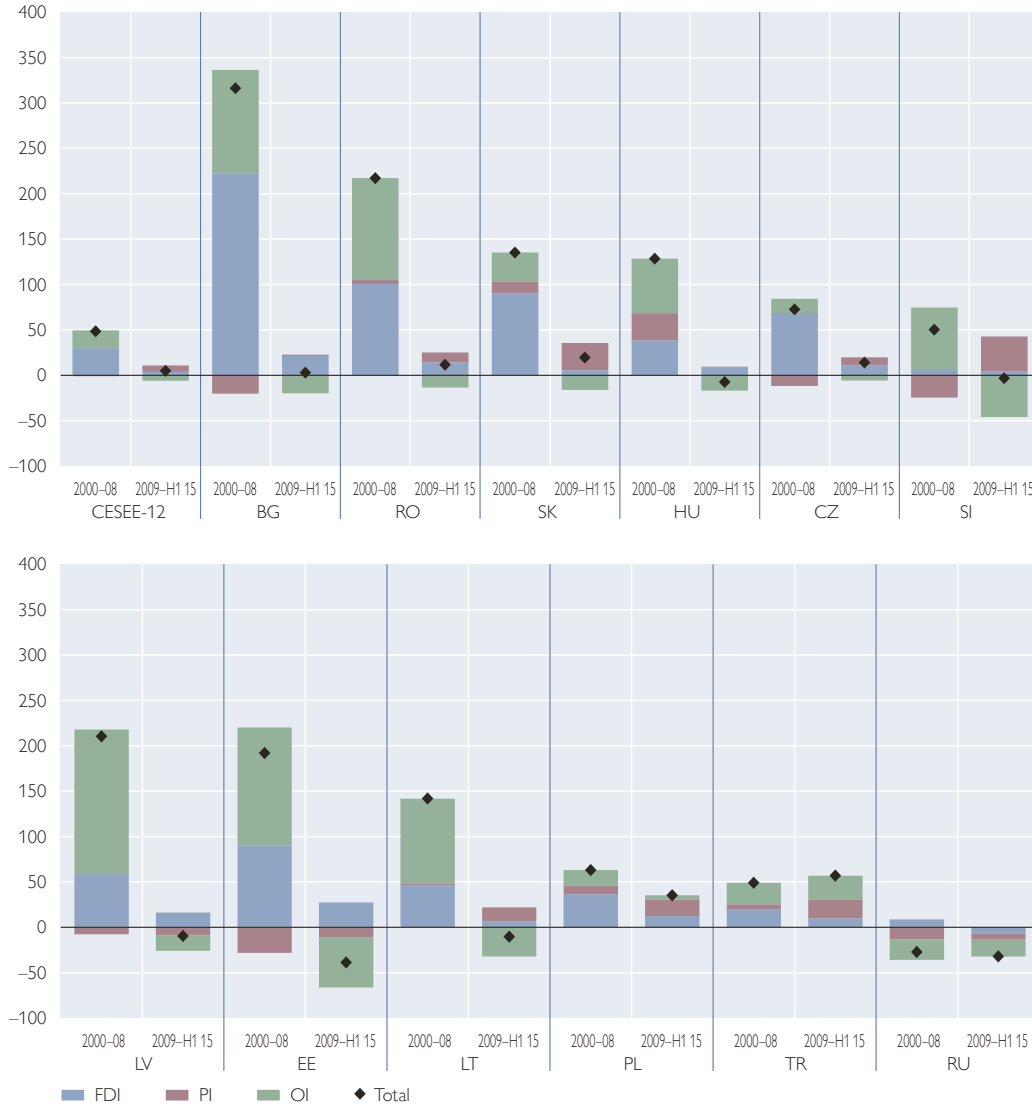
Source: IMF, Eurostat.

Chart A2

Net capital flows: 2000–08 versus 2009–15

Net FDI, PI and OI liabilities (net incurrence of liabilities less net acquisition of assets)

% of GDP in the first year of observation (2000 and 2009, respectively)



Source: IMF, Eurostat.

