

# Exchange Rate Regimes During Crisis: The Case of Emerging Europe

The first draft for the 15<sup>th</sup> International Conference on Macroeconomic Analysis and International Finance, Rethymno 26-28 May 2011

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**Summary:** Global economic crisis confronted economic authorities of Emerging European Countries (EECs) with abrupt financial and real shocks. Capital reversals, as well as trade shocks, imposed new challenges of dealing with rising external shocks, while the adjustment mechanisms differed according to accepted Exchange Rate Regimes (ERRs). Baltic countries, with rigid ERRs, were forced to accept internal devaluation accompanied with significant output and employment losses. Emerging European countries with flexible ERRs, from the other side, allowed significant currency depreciations, thus accepting the role of exchange rate as a shock absorber. Empirical research is based on ten EECs in the period 2004:01-2010:12 and 2004:01-2008:01 pre-crisis period. The paper explores real exchange rate as an adjustment mechanism variable, crisis transmission to the real economy; and foreign exchange interventions as a way of ER management/defence. Investigated relations are observed in order to distinguish between the groups of “floaters” and “fixers” EEC.

**Key words:** External shocks, Macroeconomic adjustment, Fixed ERR, Flexible ERR, Emerging European Countries.

**JEL:** F31, F32, F41.

## Introduction

World economy has been going through the strongest economic crisis since previous Great Depression of the 1930s. The global crisis was rooted in subprime crisis initiated with a drop in housing prices in USA in 2007, that continued through major liquidity crisis when Lehman Brothers bankrupted, and through deterioration in output performance and recession in most economies in the period 2008-2011. Ongoing global crisis took place in two stages (Mishkin 2010): in the first stage, the period August 2007-August 2008, losses happened in a relatively small part of the USA financial market, namely subprime residential mortgages. Despite mentioned weaknesses in financial market, real GDP in the USA continued to grow in the second quarter of 2008, while predictions point to only a mild recession. The second stage started in mid-September 2008 when the financial crisis entered a far more virulent phase marked with the bankruptcy of the investment bank Lehman Brothers on 15 September, the collapse of the insurance firm AIG on 16 September, and run on the Reserve Primary Fund money market fund on the same day, and with the intention to pass the Troubled Asset Relief Program (TARP) in USA.

Blanchard (2009) answers to the question how could relatively limited and localized event, such as subprime loan crisis in the USA, have effects with such influence on the global economy. Although the trigger for the crisis was the decline in housing prices in the USA, in preceding years *four factors* must be taken into account in order to better understand how price decline in localized market turned into a major world crisis: (i) assets were created, sold, and bought, which appeared much less risky than they truly were; (ii) securitization led to complex and hard to value assets on the balance sheets of financial institutions; (iii) securitization and globalization led to increasing connectedness between financial institutions, both within and across countries; (iv) leverage increased. Concerning *amplification mechanisms*, Blanchard states that the first amplification mechanism is the modern version of bank runs, while the second one comes from the need by financial institutions to maintain an adequate capital ratio. The *consequences* behind the mechanisms were: contagion across assets, institutions, and countries; increase in counterparty risk; tightening banking standards; emerging markets spreads and “sudden stops”; the transformation from the financial crisis to a full-fledged economic crisis. For more details concerning roots and contagion effects of the global crisis see Blanchard 2009, Gallego et al. 2010, Mishkin 2010, Kouretas and Vlamis 2010, Josifidis, Lošonc, and Supić 2010, Merrouche and Nier 2010, O’Hara 2011.

Heterogenous experience across Emerging Countries (EC) has been emphasized by Llaudes, Salman, and Chivakul (2010) underscoring that the impact of crisis to output losses in EC depends from pre-crisis economic fundamentals and global linkages. EC with smaller pre-crisis vulnerabilities went into recession later and exited earlier, thus suffering less in output decline during crisis. Expectedly, EC with stronger external linkages, i.e. higher dependence on demand from advanced economies or larger exposure to foreign bank claims, experienced larger output losses in crisis phase. Blanchard, Faruqee, and Das (2010) analysed trade and financial channels of crisis transmission to 33 EC during crisis. Different effects of growth performances are dependent from the extent of trade and financial exposures, as well as growth performances of key trade partners. Countries with fixed ERRs experienced much worse consequences. Authors argue that the effect of ER in their model is ambiguous i.e. dependent on the strength of expenditure switching and balance sheet effects. However, the factors that shaped the effects of the crisis in each country could be better understood on the basis of case studies, although these factors can hardly be captured by econometrics.

The worstly hit by global economic crisis within the group of EC were Emerging European Countries (EECs) with the highest output losses. However, in heterogenous sample of EECs (Central, Eastern and South-Eastern European countries), Baltic and South-Eastern European economies were hit harder than other countries, highlighting the fact that already vulnerable economies and more financially integrated suffer more from external shocks. Emerging European Countries were experiencing economic boom before global crisis characterized with relatively strong GDP growth according to easy external financing conditions, as well as positive expectations related with ongoing convergence towards the EU. These economies weren't faced with significant consequences of global crisis until the last quarter of 2008 that could be viewed in the light of non-exposure to subprime or subprime-related assets. However, resilience to global turmoil was stopped since September 2008. The decrease in investor confidence and "sudden stop" in capital inflows, on which EECs relied upon to finance credit and GDP growth, meant that EECs were hit hard with the crisis, even harder than other emerging countries, such as Latin American region (Gallego et al. 2010).

In this paper, authors try to examine the relation between crisis consequences and practised ERR in the case of selected EECs. Traditional argument in the case of flexible ER is its role as a shock absorber in the case of external shocks. According to this argument, EECs which practised rigid ERRs should experience more severe consequences under external shocks. Contrary, EECs with flexible ER in the role of shock absorber should experience milder effects to the real economy. Many authors (in)directly have explored the role of ER as a shock absorber, the relation between ERRs and external shocks, influence of practised ERR to output variations, economic growth, in the pre-crisis and crisis period (for instance, Eichengreen and Hausmann 1999; Edwards and Levy Yeyati 2002, 2003; Broda 2004; Furceri and Zdzienicka 2010; Ahmad and Pentecost 2010; Blanchard, Faruqee, and Das 2010; De Carvalho Filho 2010, 2011; etc.). Our analysis is focused to two groups of EECs distinguished according to practised ERR - fixed ERR group ("fixers") vs. flexible ERR group ("floaters") - in order to reveal a general pattern how these countries differ concerning crisis consequences. We use the sample of 10 EECs in the period 2004:01-2010:12 and sub(pre-crisis)period 2004:01-2008:01, trying to shed some light to the wide accepted argument in the favor of flexible ERRs – that under external shocks flexible ER serve as a shock absorber by isolating the economy and preventing painful internal adjustment process. At the same time, authors are conscious that such complicate adjustments mechanisms cannot be caught at the same time with relatively simple models because of plenty interactive and simultaneous causal relationships between related variables.

The paper is structured as follows: Section 1 reviews the literature related with the impact of global crisis and the role of ERRs in EECs; in the Section 2 we analyse adjustment mechanisms under fixed vs. flexible ERRs by stressing related literature; within Section 3 are presented crucial stylized facts of explored EECs during investigated period; Section 4 exposes the methodology used and key empirical findings; finally, Section 5 concludes.

## 1. The Impact of Global Crisis and the Role of ERRs in EECs: Literature Review

The global crisis from 2008 affected emerging countries in different ways depending on their previous growth models, associated with different types of international integration. Emerging European Countries were among those countries that suffered the most from the economic crisis. Wide range of literature deals with the problem of crisis impact to emerging economies, particularly EECs (Berglöf et al. 2009; Shelburne 2009; Llaudes, Salman, and Chivakul 2010; Gallego et al. 2010; Myant and Drahokoupil 2010; Aizenman, Lee, and Sushko 2010; Frankel and Saravelos 2010; Popov 2010; Gardó and Martín 2010; Charalambos 2010; Blanchard, Faruqee, and Das 2010; etc.).

Along with Gallego et al. (2010) who detect two phases of crisis transmission to EECs, namely phase until September 2008 marked with the resilience to global turmoil and phase since September 2008 when resilience was stopped, Berglöf et al. (2009) research the impact of crisis in Emerging Europe stating that the EECs pass through three different stages: decoupling (July 2007-September 2008); the crisis hits (October 2008-March 2009); and tentative stabilisation with rising crisis costs (April 2009-present). At the first stage, EECs were unaffected first four quarters of the crisis, except four countries (Baltic states where credit booms had peaked and begun to reverse even before the onset of the global crisis; and Kazakhstan). Namely, in most EECs capital inflows held up with further credit financing of domestic demand. At the second stage (fourth quarter of 2008), marked with the collapses of Lehman Brothers and Washington Mutual, the crisis strongly hit the EECs with large decline in industrial production and weakening credit growth. Also, risk premiums, bank lending flows, FDI flows, export volumes - all turned negative. Third stage was characterized with general recovery in global financial markets and the improvement in regional financial indicators since March 2009. Decrease of industrial output was either slowed or reversed, together with the stabilization of the confidence indicators. However, spill-over effects of financial and real external shocks to households, corporate and banking sectors, were still present in the sense of unemployment, insolvencies and non-performing loans<sup>1</sup>.

Myant and Drahokoupil (2010) explore different impact of world financial crisis across transition economies stressing that forms of international integrations are directly linked to the nature of vulnerabilities. Authors differ three types of integration through export of goods and two types of integration through financial inflows. The financial form of integration is related to the dependence on credit inflows or, as authors called, “financialised” development. Nevertheless, authors distinguish between FDI as relatively stable and favorable inflows, since it cannot be pulled out quickly and it could increase national export potential. From the other side are credits by banks to households, firms or government, that covered current account deficits in many transition economies.

Since EECs were basically relied upon capital inflows to finance their current account deficits in pre-crisis stage, in crisis circumstances economic authorities were

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<sup>1</sup> As Gallego et al. (2010) and Berglöf et al. (2009), Myant and Drahokoupil (2010) also analysed crisis impact to EECs by identifying different phases: the credit crunch; the demand slump; further downward pressures; and the fiscal and solvency crisis. At the stage of further downward pressures EECs dependent on financial inflows and with credit debt in foreign currency were faced with severe consequences. The drop in domestic incomes and real-estate prices from previous stages, worsened balance sheet positions of private sector with the increase in non-performing loans with potential undermining effects to overall banking system.

confronted with capital outflows, foreign demand drop and real trade shock, and consequently depreciation pressures. Aizenman, Lee, and Sushko (2010) explored financial (changes in short-term and portfolio debt, equity and FDI inflows) and trade factors (changes in balance of trade and commodity terms of trade) in accounting for exchange market pressure (weighted sum of exchange rate depreciation and international reserves loss) during the period of Great moderation (pre-crisis period 1987-2007) and the global crisis of 2008-9. Exchange market pressure is the response to the shocks coming from the financial area (capital inflows or “sudden stops” as a capital account shock) and international trade area (drop in export as a current account shock). Authors proved, via panel regression model on the sample of 28 emerging economies, that fast financial integration of emerging markets during 1990s exposed them to significant debt exposure, while rapid increase in their trade openness exposed them to severe effects of the collapsing international trade activities. Although authors conclude that both factors are relevant, the impact of financial factors is stronger compared to trade factors, especially during the crisis. Although emerging economies were greatly affected by commodity prices decline during initial phase of the crisis, the relative impact of trade factors remained approximately the same during global crisis as in the pre-crisis period. Capital outflow was the main force behind exchange rate market pressure in emerging economies during global crisis. Myant and Drahekoupil (2010) point that “sudden stop” problem was important in the middle and higher income transition economies, but of less significance for the lowest income countries. From the other side, Popov (2010) also stresses that capital flows to developed and developing countries changed dramatically during recent crisis<sup>2</sup>. However, the author points that reduction in capital inflows in 2008-2009 didn't contribute to recession, although it is usually believed that the reduction of the capital inflows contributes to the decline in output (recession). The performance of developing countries that were most affected by the reduction of the capital inflows was actually better than the performance of developed countries. There was no correlation between shocks to the capital account (change in the inflow of capital) and economic performance as measured by the change in GDP in 2007-09 or in 2009 alone.

Surprising thing about the crisis impact to EECs is the fact that it's the only region to be really seriously negatively impacted that did not own significant amounts of the sub-prime assets that were at the center of the crisis. Shelburne (2009) tries to find the answer to the question why EECs that owned few sub-prime assets experienced the worst of the financial crisis, and not as expected the USA and West European countries since they owned almost all sub-prime assets. The answer lies in vulnerability of EECs to trade and financial shock. Trade shock assumed that this region mainly traded with Western Europe which suffered extensively, and financial (and crucial reason) shock assumed the “sudden stop” since EECs were heavily dependent on external capital to finance its development. Shelburne (2009) differs between FDI which fell about half of its pre-crisis level (fall to about 2% of GDP in 2009); bank loans and bond issues as most volatile component of capital inflows are expected to be significantly negative in 2009; and remittances as major capital inflow extremely important for transition economies and new EU member states ranging from 5-20% of GDP (much higher than average for emerging and developing group of countries of about 2% of GDP). The country seems to be more vulnerable to crisis

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<sup>2</sup> In particular, emerging economies experienced a decline in external financing – “from an inflow of \$250 bill. in the second quarter of 2008, before the crisis, to an outflow of 200 billion in the fourth quarter of 2009. In the second and third quarters of 2009 capital inflows to developing countries returned to pre-crisis level, although later they declined to about \$50 billion in the first quarter 2010”. Popov (2010).

external shocks if it experienced larger output drops, bigger stock market falls, greater currency weakening, larger losses in reserves, or the need for access to IMF funds (Frankel and Saravelos 2010). However, Frankel and Saravelos (2010) empirically tested leading indicators of financial crisis and concluded, as earlier literature suggest, that foreign exchange reserves and past movements in RER are two main indicators in explaining crisis incidence. Namely, level of reserves in 2007 and recent RER appreciation is consistent and statistically significant leading indicator of the crisis.

Gardó and Martin (2010) analyse the impact of global crisis to Central, Eastern and South-Eastern Europe (CESEE) stressing the fact that ERR, beside fiscal positions, determined the ability of economic policy to counter the real effects of the crisis. Authors argue that there is a difference between “fixers“ and “floaters“ concerning net export and changes in international competitiveness during crisis. Namely, real effective exchange rate, in line with nominal effective exchange rate, of CESEE countries with floating ERRs start to depreciate since mid-2008. From the other side, in countries with fixed ERRs real effective exchange rate continued to appreciate until beginning of 2009, with relatively weak depreciations in 2009 as many trading partners’ currencies sharply depreciated against the euro. Real exchange rate appreciation in rigid ERRs was deteriorated in crisis, but it existed in a boom (pre-crisis) period since wage increases exceeded productivity gains. For more details concerning the situation in Baltic states and rigid ERRs, see Purfield and Rosenberg 2010.

Berkmen et al. (2009) empirically test differences in the output impact across developing and emerging markets using cross-country regressions. Authors identify set of significant variables and, among other factors, highlight that countries with more flexible ER tend to experience smaller growth revisions. In most regressions, countries with pegged ER experienced on average larger downward growth revisions (in excess of two percentage points) compared to countries with more flexible ER. Popov (2010) also distinguishes between fixed and floating ERRs emphasizing that devaluation in response to negative current or capital account shock provides automatic competitiveness improvement. Hence, in the case of floating ER, capital outflow or negative trade shock don’t necessarily cause a recession due to shock absorbing role of ER. The crucial author’s empirical finding is that negative shocks to current and capital account don’t lead to a fall of GDP growth rate if foreign exchange reserves (and consequently money supply) don’t decline proportionately. If negative shocks are absorbed through devaluation/depreciation, the negative impact of external shocks is much weaker. If the external shock is relatively small (up to 3% of GDP change in trade and capital account), it is possible to neutralize them via devaluation. Larger shocks mean that devaluation cannot absorb enough negative external shock effects.

The connection between ERRs from one side and output losses and growth resilience from the other side is highlighted by Charalambos (2010). The author concludes that growth performance for “pegs” wasn’t significantly different from that of “floats” during crisis. Authors analyse trade exposure (captured by partner growth and terms of trade shocks) and financial channel variables (captured by reserves and short term debt) concluding that these factors were important for the growth performance during the crisis, although in the recovery process only trade channel is important for growth performance. However, the situation concerning the relation between ERR and growth performance is different in a recovery phase 2010-2011 when “pegs” behave worse in the sense that growth recovers slower compared to “floats”. On the basis of his empirical findings, the author argues that ERRs have had asymmetric effect during and recovering from the crisis.

As the literature indicates, most of EECs didn't experience serious effects of the crisis until the bankruptcy of Lehman Brothers; therefore, most of them experienced annual growth in 2008. Significant decline happened in 2009, but growth returns in 2010. The situation is largely similar in new EU member states and current transition economies, with the exception of Baltic economies that were hit early and experienced declines in 2008, even larger declines in 2009 and negative growth in 2010. The Baltic countries suffered some of the largest drops in industrial production and GDP during crisis compared to other emerging countries. Estonia, Latvia and Lithuania were most affected by global financial crisis than any other regions with cumulative output declines of 20%-25% from their peak levels. In the period 2008-2010, Estonia experienced real decline in GDP of 21% , Lithuania 23%, and Latvia 27%. Shelburne (2009) compare Baltic states and their recessionary adjustment with the US GDP fall of 29% during Great Depression, and Argentina of 22% during 1998-2002 crisis i.e. with the cases of worst financial crisis of the previous century. Author elaborates primary vulnerability of EECs, namely dependence on capital inflows, concluding that EECs had unsustainable current account deficits prior the crisis<sup>3</sup>.

Under crisis circumstances Baltic economies, which externally-financed domestic demand boom, experienced abrupt output collapse that bring back an income level to the 2005/06 levels. Real economy was primarily affected through domestic demand channel and export channel (Purfield and Rosenberg 2010). Domestic demand channel worked via "sudden stop" in banks' credit expansion, investor and consumer shaken confidence, sharp decline in government spending, and further weakening of private demand through nominal wage cuts and unemployment rise. Export channel worked via main trading partners which were also hit (although not equally) with crisis shocks and through the fact that currencies of trading partners significantly depreciated inducing RER appreciation for Baltic economies. Purfield and Rosenberg (2010), however, conclude that export channel (although the fall in export wasn't negligible, 27% between 2008Q3 and 2009Q3) wasn't crucial reason for GDP fall, but primarily domestic demand. The costs of internal adjustments in Baltic economies are related with their rigid ER to the euro and impossibility of depreciation and competitiveness improvement (Frankel and Saravelos 2010; Popov 2010; Purfield and Rosenberg 2010). Popov (2010) argues that Estonia, Latvia and Lithuania experienced the largest output fall in the period 2007-2009 in range 12%-22% not because of trade and capital account shocks (-2% GDP that isn't large), but above all due to ER policy and obligation to preserve the rigid parity. Baltic states' adjustment strategy was notably relied upon contractionary fiscal and nominal wage policies, contrary to nominal ER adjustment. Adjustment process under rigid ERR assumed internal devaluation<sup>4</sup> via fiscal and nominal wage cuts that brought results, but with clear real economy sacrifices<sup>5</sup>.

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<sup>3</sup> The starking example is Latvia who "had a deficit of almost 22% of GDP in 2007 but is expecting a surplus in 2009 of over 4% of GDP. This is turnaround of 26% of GDP in an economy with fixed exchange rate." Similar situation is in Estonia with relatively weaker turnaround in current account balance, "Estonia had a deficit of almost 18% of GDP in 2007 but is forecast to have a surplus of 2% in 2009 and 2010." (Shelburne 2009).

<sup>4</sup> Purfield and Rosenberg (2010) under the term "internal devaluation" assume: fiscal adjustment, nominal wage adjustment, financial stability preservice, private corporate and households balance sheet repairation.

<sup>5</sup> Adjustment progress is reflected in: reduced fiscal deficits to pre-crisis level, disappearing external imbalances and inflation, maintained confidence in ER parity, improved competitiveness. However, social costs of adjustment process were reflected in unemployment surge and wage fall. Adjustment was extremely socially costly in the Baltic states, which defended their fixed ER through public spending and wage cuts. "In June 2009 Latvia, the worst hit country, implemented spending cuts and tax increases of €712m, designed to reduce the budget deficit by 10 percent of GDP in the next three to four years. It cut wages in the public sector by almost

## 2. Adjustment Mechanisms under Fixed vs. Flexible ERRs

According to conventional theoretical background, a key argument for adopting flexible ER is the role of ER as a shock absorber. Mentioned characteristic of flexible ER is especially emphasized in the circumstances when the economy is hit with external shocks. In this case, the economy doesn't have to accept the burden of adjusting process related to price, output and employment decrease. When the external shock arrives, the nominal exchange rate and real exchange rate (RER) depreciates, price competitiveness and external balance improves without significant lowering of economic activity. From the other side, fixed exchange rate is useful as a nominal anchor. But, in the case of external shocks, the parity is preserved only at the cost of internal balance flexibility in the sense of reducing prices and economic activity. Exchange rate must be maintained and economy is subjected to deflationary automatic adjustment mechanism. In the middle ground, between rigidly fixed parities and floating ER, there are numerous intermediate ERRs which actually combine the benefits of both regimes concerning stability (nominal anchor role) and flexibility (shock absorber role), but at the same time are susceptible to speculative attacks in the case of complete capital mobility. In intermediate ER forms, economic authorities do not necessarily have to perform internal devaluation since the obligation of parity defence isn't so strict as in the case of the currency boards. Also, it is possible that economic authorities combine the devaluation as external adjustment and internal adjustment with mixed effects to internal and external balance. For comprehensive EMU study of macroeconomic adjustments under fixed and floating exchange rates, see HM Treasury (2003).

In any case, the dilemma shock absorber or nominal anchor role of ER during crisis in EECs should be observed in the light of pros and cons of both roles since there are specific vulnerability points in emerging economies that impeding the dilemma.<sup>6</sup> From one side are factors in favor of peg maintenance: (i) vast majority of bank loans to households and corporates are denominated in euro, therefore, ER depreciations would dramatically worsen private sector net worth that could lead to insolvencies and non-performing loans with the negative feed-back effects on the financial system and economy as a whole<sup>7</sup>; (ii) ER pass-through was assumed to be high in EECs due to indirect (large import content of exports) and direct (price of final imported goods) transmission channels; (iii) in economies where ER serves as traditional nominal anchor since the beginning of the transition process, peg abandoning could undermine confidence and macroeconomic stability. From the other side are factors that favor the shock absorbing role: (i) competitiveness improvement due to currency weakening, although export-led growth is less likely during crisis; (ii) currency weakening could help in avoiding high social costs due to consequences of internal adjustment, namely raising unemployment and wage cuts.

Edwards and Levy Yeyati (2002) explored the connection between ERRs and economic growth in the case of 186 countries in the post-Bretton Woods period. Authors

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40 percent and reduced pensions by 10 percent. It also reduced benefits and increased payments in health care." (Shelburne 2009).

<sup>6</sup> Extensive analysis of the dilemma fixed vs. flexible ERRs, as well as crucial vulnerability points in the case of emerging and transition economies in practising different ERRs, could be found in Josifidis, Allegret, and Beker (2009).

<sup>7</sup> Eichengreen and Hausmann (1999) have argued that flexible ERRs aren't effective in countries where public and private sectors have debts denominated in a foreign currency. It is even possible that a flexible ERR amplify the negative effects of terms of trade shocks due to balance sheet effects, rise of debt in domestic currency, and potential bankruptcies, insolvency and growth reduction.



argue that less flexible ERRs are related with slower growth and higher output volatility for developing countries. For developed countries ERRs do not have any significant influence on growth. In another study, Edwards and Levy Yeyati (2003) investigated flexible ER as shock absorber and empirically confirmed this role. Authors find evidence that terms of trade shocks are more severe in countries with rigid ERR, and that trade shocks worked asymmetrically in the sense that the stronger output response was in the case of negative trade shocks. From recent studies, Furceri and Zdzienicka (2010) used unbalanced panel of 159 countries to explore medium and short term output losses under banking crisis in the period 1970-2006. Authors confirm that output losses are larger in the case of countries with fixed ERRs, contrary to flexible ERR group. In developing countries with flexible ERR, the impact of banking crisis on real output is below 1% in the short term, while for countries with fixed ER this impact is about 2%. This difference is even more visible when the authors observe the banking crisis at medium-term.

De Carvalho Filho (2010) investigated crisis impact to inflation targeting (IT) and non-inflation targeting (non-IT) countries. Since IT monetary framework is compatible with flexible ERRs (almost perfect coincidence between the two regimes), authors conclude that IT countries were able to lower nominal and real policy rates more and thus avoided higher deflationary losses. Also, IT countries were able to experience significant real ER depreciations and consequently did better on switching demand towards domestic goods and exports. As a result, unemployment and output losses were mitigated. Advanced IT countries have had relatively stronger industrial production performance and higher GDP growth rates than their non-IT peers; however, authors didn't confirm this result in the group of emerging economies or in the full sample. In the author's continuation of exploring this topic, De Carvalho Filho (2011) investigated the sample of 51 advanced and emerging IT countries with flexible ERRs claiming and proving again that IT countries have fared better than their peers in the terms of post-crisis GDP growth, despite the inclusion of pre-crisis determinants in the model and the use of different sub-samples.

Ahmad and Pentecost (2010) used a structural VAR model on the sample of 22 African countries for the period 1980-2005 in order to find out how selected countries cope with terms of trade shocks under different ERRs (11 countries in the sample practised flexible, while other 11 countries practised fixed ER). The key finding is that countries with flexible ERRs experienced adjustment process undertaken mainly through variations in the RER. The effects of the terms of trade shocks on output fluctuations are significant in observed countries determining about 10%-36% of output fluctuations in 20 out of 22 investigated countries. However, influence on output is more pronounced in the fixed ERRs than in flexible. Generally, the percentages of output variations attributable to terms of trade shocks are higher in pegging countries than in floating regimes.

The influence of terms of trade shocks to real GDP, RER and prices according to different ERRs is also investigated by Broda (2004). The author researched post-Bretton Woods period 1973-1996 in the case of 75 developing countries concluding that responses of output, RER and prices differed across ERRs. Namely, countries with fixed ERRs confronted with negative terms of trade shock experienced larger and significant declines in real GDP by means of a price decrease (having in mind relatively slow RER depreciations). Blanchard, Faruqee, and Das (2010) investigated the impact of crisis on EC stating that the role of ERR is an important one. However, the authors state that this role is dependent from various factors, among others, types of shocks, whether ML conditions are met or violated, balance of sheet effects, indirect (interest rate policy) or direct (foreign exchange interventions) monetary measures to maintain the peg. Authors analysed 33 emerging

economies in the period 1996-2010 and divided sample into two groups, fixed and flexible ERRs according to IMF *de facto* classification. Countries with fixed ERRs had an 18% average growth decline (14% if Baltic countries, with most severe growth effects, are excluded), compared to 11% for the flexible ER group.

### 3. Stylized Facts and Descriptive Analysis

Descriptive analysis is related to selected EECs which are differentiated according to practised ERRs, fixed or flexible. Table 1 in the Appendix shows practised ERRs in the case of EECs in the period 1990-2010. We excluded from our analyses EECs that entered the euro-zone (thus, they are under rigid ERR in the form of the monetary union; Slovenia since 2007 and Slovak Republic since 2009), as well as Montenegro which operated under official euroization (euroization as a form of rigid ERR without sovereign monetary reactions to external shocks). Therefore, selected and analysed EECs which practised fixed ERRs are Estonia, Lithuania, Latvia, Bulgaria and B&H (rigid currency board arrangement), and Croatia (conventional fixed parity). Emerging European Countries which practised flexible (managed floating) ERRs are Poland, Czech Republic, Hungary, Romania, Serbia, and Albania. Relevant macroeconomic indicators observed in this section cover: current account deficit (in millions of US dollars), FDI (in millions of US dollar), export level (in millions of national currency or US dollar), nominal exchange rate (directly noted as national currency per US dollar), foreign exchange reserves (in millions of US dollar), unemployment rate, and GDP level (in millions of national currency). The frequency of time series is quarterly (yearly frequency only in the case of current account deficit) from IMF database in the period 2004:Q1-2010:Q4.

Most EECs had large current account deficits before crisis, hence they were dependent of external capital inflows. Figure 1 in Appendix shows current account deficit (in millions of US dollars) in the case of fixed ER country group, while Figure 2 shows the same yearly time series in the case of floating ER country group. The general pattern is that current account was in negative zone for both group of countries, regardless of ERR, that clearly points to dependency from external financing. However, since second and third quarter in 2008, the current account deficit was gradually decreased. This improvement in external balance was related with adjustments under fixed or flexible ERR that resulted in improved competitiveness in both cases, either in the form of internal devaluation or nominal ER depreciation.

The period of crisis was accompanied with significant trade and financial external shocks. The drop in export level, as one way to identify decreasing foreign demand, was common for all countries, as well as the drop in FDI inflows regardless from practised ERR. However, although the situation from the aspect of FDI is not so distinguishable to deduce specific conclusions from the aspect of implemented ERR (see Figures 3 and 4 to observe FDI in the case of fixed vs. flexible ERRs, respectively), it seems that export decrease was more serious in the case of fixed ERRs (see Figure 5 and 6 to observe export level in the case of fixed vs. flexible ERRs, respectively). This observation is logic having in mind that depreciations automatically improve competitiveness and, in more or lesser extent, neutralize initial shock (foreign demand drop).

The impact of external shocks in crisis circumstances and adjustments mechanisms are different depending from implemented ERR. Figure 7 in the Appendix shows nominal exchange rate (NER) directly noted as national currency per US dollar in the case of selected

EECs in the period 2004:Q1-2010:Q4. In the case of Estonia and Croatia, compared to other countries, the parities were adjusted in minor extent; Estonia in the range 10-13 krooni per dollar, and Croatia in the range 4.6-6.2 kuna per dollar. Figure 8 shows nominal exchange rate (directly noted as national currency per US dollar) in the case of mentioned economies in the period 2004:Q1-2010:Q4. It is clearly observable that these countries *de facto* practised flexible ER having in mind changes in the nominal value of the currency. In the explored period Polish currency change its value from 2.2 to 3.9 zloty per dollar; Czech currency fluctuate in the range 15.9-26.6 koruny per dollar; Hungarian currency fluctuate in the range 157.3-226.2 forints per dollar; Romanian currency 2.3-3.4 lei per dollar; Serbian currency 51.3-81.5 dinars per dollar; Albanian currency 78.2-107.9 leks per dollar. However, important note is that these countries experienced significant drop in currency value in the crisis period 2008:Q1-2010:Q4 which unambiguously indicates shock absorbing role of their ER. Concerning foreign exchange reserves as a way of defence parity/mitigate fluctuations of ER, Figure 9 and Figure 10 shows foreign exchange reserves level (in millions of USD) in the period 2004:Q1-2010:Q3 for “floaters“ and “fixers“ respectively. Foreign exchange reserves decreased in both groups of countries, but more in the case of fixed ERRs compared to the case of flexible ERRs. Foreign exchange reserves in fixed ERRs are used more frequently and in larger extent to defend the parity, while in the case of flexible ERRs the usage of foreign exchange reserves is less frequent and in less extent since monetary authority doesn't defend any parity although it manages the fluctuations.

As expected and found in related literature, the crisis consequences to the real economy were higher for countries which practised fixed ERRs. Observing quarterly time series of GDP in national currency, as well as unemployment rates, it is obvious that Estonia, Lithuania, Latvia, Bulgaria, B&H, and Croatia, experienced larger drop in economic activities (see upper graph in Figure 11 for unemployment rate and Figure 12 for GDP level). This conclusion is based on the comparison of mentioned indicators with the another group of countries which practised flexible ERRs. Namely, in the case of Poland, Czech Republic, Hungary, Romania, Serbia, and Albania, decrease in GDP level, as well as the rise in unemployment rate, were moderate and lower than in the case of fixed ERR group (see lower graph in Figure 11 for unemployment rate and Figure 13 for GDP level).

Coefficient of variation (CV), as a standard relative measure of variability, indicates that the variations of real economy indicators were much higher for fixed ER group than for the flexible ER group. Figure 14 shows CV of unemployment rate (right graph) and GDP level (left graph) in the case of fixed and flexible ER country group. Coefficient of variation of unemployment rate for explored EECs in the period 2004:Q1-2010:Q4 (see right graph at Figure 14) clearly indicate that countries under fixed ERRs experienced higher variations of unemployment. This indicator could be observed as a sign of recessionary automatic adjustment mechanism under fixed ERRs. The highest CV have Lithuania (almost 68%), Estonia (50%), Latvia (46%), which operate under rigid (currency board) ER form. Croatia, which operate under conventional fixed ER form, expressed relatively low CV of unemployment rate (12%). Relatively lower CV experienced Poland (25%), Romania (23%), Hungary (20%), Czech Republic (20%), and Albania (5%); all within flexible ERR group.

Coefficient of variation of GDP level (see left graph at Figure 14) also indicates mentioned tendencies – that countries which operate under fixed ERRs have higher variations of real economy indicators – although not so sharp as previous CV of unemployment rate. Currency board countries also have the highest variations of GDP level: Latvia 26%, Bulgaria 24%, Lithuania 20%, Estonia 18%. The exception is also Croatia (14%) that could be explained with the fact that Croatia haven't practised rigid (currency board),

but adjustable, fixed ER parity. Hence, the automatic adjustment mechanism is not so strict and obligatory in the case of Croatia. This country could be rather placed in the group of EECs with relatively moderate and lower CV of GDP level which practise flexible ER form: Poland 16%, Czech Republic 14%, Hungary 11%, and Serbia 11%. However, one exception in the “floating” group is Romania whose CV of GDP level is the highest (above 30%) among explored EECs.

#### 4. Econometric Analysis: Variance Decomposition in VAR Model

In order to reveal the difference in adjustment mechanism under external shocks within the fixed and flexible ERRs, VAR or VEC models are estimated for each country and with different combination of relevant variables in the period 2004:01-2010:12. However, in order to identify the influence of crisis, subperiod 2004:01-2008:01 (pre-crisis period from now on) was also used for estimation with the intention to compare whole and pre-crisis period to identify crisis impact to EECs. The first group of countries, which practised fixed ERR, is comprised from Estonia, Lithuania, Latvia, Bulgaria, and Croatia. The second group, which practised flexible ERR, is comprised from Poland, Czech Republic, Hungary, Romania, Serbia. Monthly frequency of time series are obtained through IMF database – International Finance Statistics. In econometric research are excluded B&H and Albania due to unavailability of some time series from IMF database in monthly frequency. Following time series were used in the model: nominal effective exchange rate NEER, real effective exchange rate REER, foreign exchange reserves FE, consumer price index CPI, national industrial production index IPI, G7 industrial production index G7IPI, and Chicago Board Options Exchange Market Volatility Index - VIX<sup>8</sup>. All time series are previously logarithmed before testing stationarity via Augmented Dickey-Fuller (ADF) test. In performing ADF test constant and trend are included in the level of time series, while in the first differences only constant is included. Time lag is chosen according to Schwartz Information Criteria. After stationarity testing, having in mind that most time series are I(1), Johansen’s cointegration test was performed. If time series are cointegrated, VEC model is estimated; if not, VAR model in first differences. From estimated VAR or VEC models are derived variance decomposition results in order to track the influence of impulse variable to response variable during 12 months after the initial shock.<sup>9</sup>

##### 4.1 Real Exchange Rate as an Adjustment Mechanism Variable

Real exchange rate provides one of the adjustment mechanisms in the medium and long run under both ERRs, fixed and flexible. If ERR is fixed, RER adjusts through movements in foreign and domestic price levels. If ERR is flexible, RER adjusts mainly through NER

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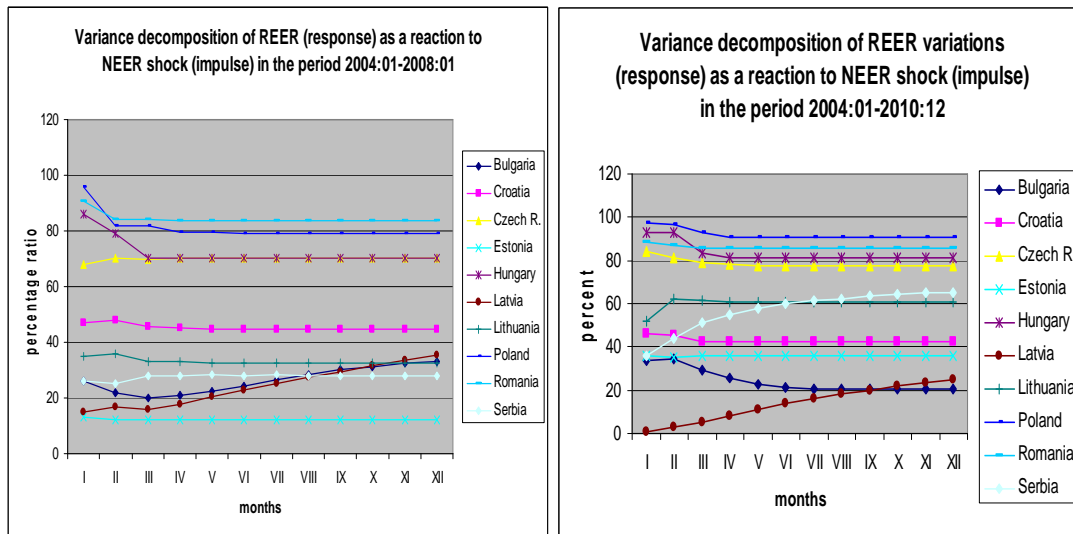
<sup>8</sup> VIX represents financial variable that approximates global risk aversion, proxied by the implied volatility of S&P 500 index options. Often referred to as the *fear index* or the *fear gauge*. It represents one measure of the market's expectation of stock market volatility over the next 30 day period. This global risk indicator was also used at the empirical investigation in Aizenman, Lee, and Sushko (2010), as well as in Berganza and Broto (2011).

<sup>9</sup> All results from ADF and Johansen’s cointegration tests, having in mind limited space, are available upon request to the authors.

movements. Nominal exchange rate flexibility smoothes the shock impact, thus preventing unemployment in the case of a negative demand shock, as well as inflation in the case of positive demand shock. Flexible NER allows quick RER adjustment, while prices and wages have limited flexibility and their impact to RER adjustment is relatively slow.

Under flexible ERRs external shocks are absorbed via NER fluctuations. NER variations induce RER variations, competitiveness improvement and buffering effect for the real economy. Export drop and decrease of capital inflows during crisis involve NER depreciations, and consequently RER depreciations, in floating EECs group. In other words, in variations of REER should dominate NEER shocks, more than price shocks. Figure 16 from the left side shows pre-crisis period and from the right side whole researched period. The Figure shows the percentage ratio of REER variations explained by NEER shock during 12 months. As Figure shows, relatively higher influence of NEER shock to REER variations during 12 months is evident for Poland (98%-90%), Romania (89%-85%), Hungary (93%-81%), Czech Republic (84%-78%). Serbia has relatively lower influence of NER variations to RER variations in the first month (36%), but with rising effect from month to month reaching the ratio of 65% after a year. From the other side, countries with fixed ERRs, have relatively lower ratio of NEER shock to REER variations: Lithuania (52%-61%), Croatia (46%-42%), Estonia (36%), Bulgaria (34%-21%), Latvia (0.5%-25%).

**Figure 16** Influence of NEER shock to REER variations (percentage ratio) for the periods 2004:01-2008:01 (left graph) and 2004:01-2010:12 (right graph) in the case of selected EECs during 12 months



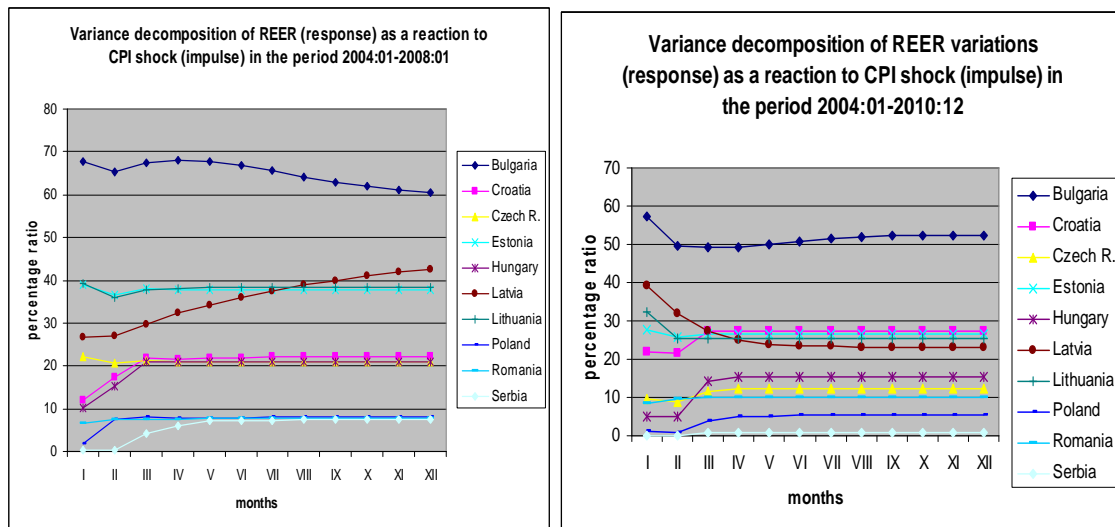
Source: Authors' estimations.

As Figure 16 shows, comparison of variance decomposition results for two periods (whole period and pre-crisis period) reveals no significant difference in relation to previous conclusions. Namely, countries where NEER variations explained the main part of REER variations are again Poland, Romania, Hungary and Czech Republic (the “floaters”), while the countries with fixed ERRs have relatively lower percentage ratio of NEER shock in explaining REER variations (cases of Croatia, Lithuania, Bulgaria, Latvia and Estonia). Serbia is in the middle of these two groups. In the first (pre-crisis) subperiod it rather

belonged to the fixed group, although situation has changed in the crisis period and the level of NEER shocks in improving competitiveness has been higher. The result for Serbia indicates that NEER was more extensively used as a shock absorber in the crisis period, while the situation in the pre-crisis period indicates limited flexibility and combined roles of nominal anchor and shock absorber.

From the other side, observing the ratio of price shocks in explaining REER variations in the whole period (right graph at Figure 17) indicates the expected adjustment mechanism for fixed regimes. Relatively high and increasing ratio of price shocks in explaining REER variations points to competitiveness improvement via deflationary mechanism. As Figure 17 shows, countries which practised fixed ERRs expressed relatively higher influence of price adjustments (CPI variations) in competitiveness improvement (REER variations): Bulgaria (57%-52%), Latvia (39%-23%), Lithuania (32%-25%), Croatia (22%-27%), Estonia (28%-27%). Countries with managed floating ERR expressed relatively lower ratio of price adjustment in REER variations (in contrast to NEER variations): Hungary (5%-16%), Czech Republic (9%-12%), Romania (8%-10%), Poland (1%-5%), and Serbia (0.02%-0.92%).

**Figure 17** Influence of CPI shock to REER variations (percentage ratio) for the periods 2004:01-2008:01 (left graph) and 2004:01-2010:12 (right graph) in the case of selected EECs during 12 months



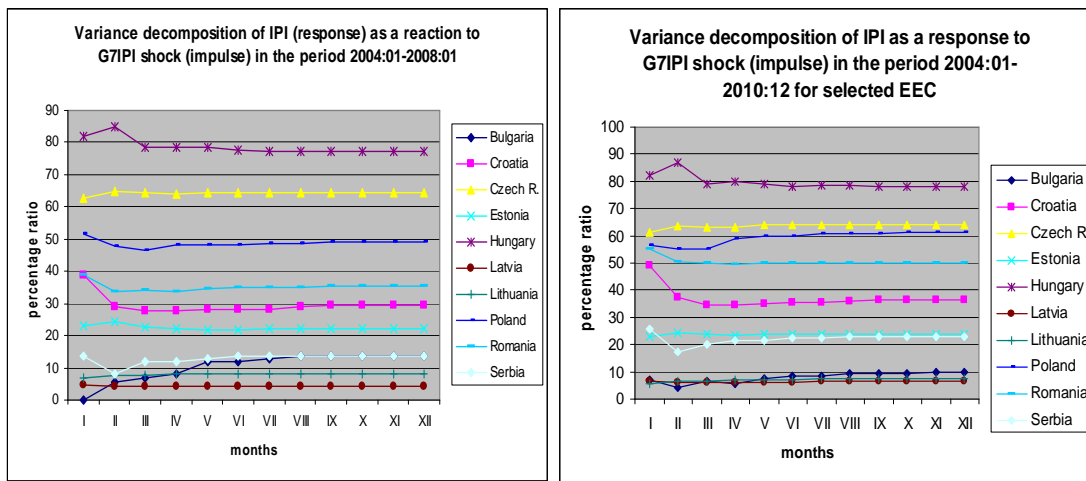
Source: Authors' estimations.

The general conclusion concerning the ratio of price shocks in explaining REER variations in the pre-crisis period isn't changed. Countries with the highest percentage ratio of CPI shocks in explaining REER variations in pre-crisis period (or the countries where price flexibility was used in order to restore competitiveness) are Bulgaria, Lithuania, Estonia and Latvia (in the case of the whole period the order was Bulgaria, Latvia, Lithuania, Estonia). Follows Czech Republic and Croatia as the countries which are in the middle of two observed groups. The countries with the lowest ratio of price shocks in explaining REER flexibility in the pre-crisis period (or the countries where price rigidity or low downward flexibility prevent competitiveness improvement) are Hungary, Romania, Poland, Serbia (at the whole period the order was Romania, Hungary, Poland, Serbia).

## 4.2 Crisis Transmission to the Real Economy of EECs

As a proxy of crisis transmission to the real economy was taken the influence of G7IPI variations to national real economy variable, namely domestic IPI. Since the global crisis was initially financial, the ordering of variables in estimating VAR or VEC models are: VIX, G7IPI and domestic IPI. In order to reveal whether the impact of crisis changes empirical findings of investigated period 2004:01-2010:12, the results are also derived for pre-crisis period 2004:01-2008:01. The results are presented in Figure 15 for both groups, “fixers“ and “floaters“, noting that at the left side are presented results for pre-crisis period and the right graph shows the results for whole research period.

**Figure 15** Influence of G7IPI shock to domestic IPI variations (percentage ratio) for the periods 2004:01-2008:01 (left graph) and 2004:01-2010:12 (right graph) in the case of selected EECs during 12 months



Source: Authors' estimations.

Variations in industrial production of most developed economies – G7, influenced domestic industrial production variations in the whole investigated period 2004:01-2010:12 at the following order: Hungary (82% in the 1<sup>st</sup> month - 78% in the 12<sup>th</sup> month), Czech Republic (61% - 64%), Poland (57% - 61%), Romania (55% - 50%), Croatia (49% - 36%), Serbia (26% - 23%), Estonia (23% - 24%), Bulgaria (7% - 10%), Latvia (6%), Lithuania (6% - 7%). Obviously, countries with flexible ERRs were more exposed and dependent from real economy performance in developed world. In this sense, “floaters“ benefited from shock absorbing role under specific crisis circumstances. In the middle ground are Croatia (with no rigid parity) and Serbia (with tightly managed floating ER system<sup>10</sup>). Finally, rigid ERRs expressed the least dependence from G7 industrial production variations.

The overall pattern is not significantly different if we observe the pre-crisis period. The order is similar concerning group of fixed and floating ERRs, with the notion that the impact of G7 industrial production was higher if the crisis period is included in the analysis. As expected, crisis period did increase the vulnerability of EECs to real external shocks or variations in industrial production level of developed countries, but did not significantly changed the previous conclusions. The order of influence of G7IPI to domestic IPI in pre-

<sup>10</sup> See the empirical results in Josifidis, Allegret, and Beker Pucar 2010.

crisis period is following: Hungary (82% in the 1<sup>st</sup> month - 77% in the 12<sup>th</sup> month), Czech Republic (63% - 64%), Poland (51% - 49%), Romania (39% - 35%), Croatia (39% - 30%), Estonia (23% - 22%), Serbia (14%), Lithuania (7% - 8%), Latvia (5% - 4%), Bulgaria (0% - 14%). The vulnerability is relatively more increased in the case of Poland, Romania, Croatia, Serbia, and Bulgaria.<sup>11</sup>

### 4.3 Foreign Exchange Interventions as a Way of ER Management/Defence

Having in mind the fact that in all ERRs foreign exchange reserves are used either to defend the parity or to mitigate ER fluctuations, the ratio of NEER shock in explaining FE variations has been explored<sup>12</sup>. The right graph in Figure 18 shows the results for the whole research period. The highest ratio of FE variations explained with NEER variations is observable in the case of Serbia (34% in the 1<sup>st</sup> month - 55% in the 6<sup>th</sup> month - 46% in the 12<sup>th</sup> month), Estonia (31% in the 1<sup>st</sup> month - 34% in the 12<sup>th</sup> month), Croatia (33%), Hungary (16%-27%), Poland (14%-17%), Czech Republic (13%), Bulgaria (13%), Romania (7%-11%), Lithuania (6%-7%), Latvia (2-3%). The results are mixed and cannot be differentiated according to implemented ERR. Namely, Serbia mostly used FE reserves to limit/manage NEER fluctuations in the explored period, followed by Estonia and Croatia which used FE reserves to defend the parity. Countries with the least usage of direct interventions to defend the parity are Lithuania and Latvia which could be explained with the fact that these countries maintained the parity dominantly through internal adjustment mechanism.

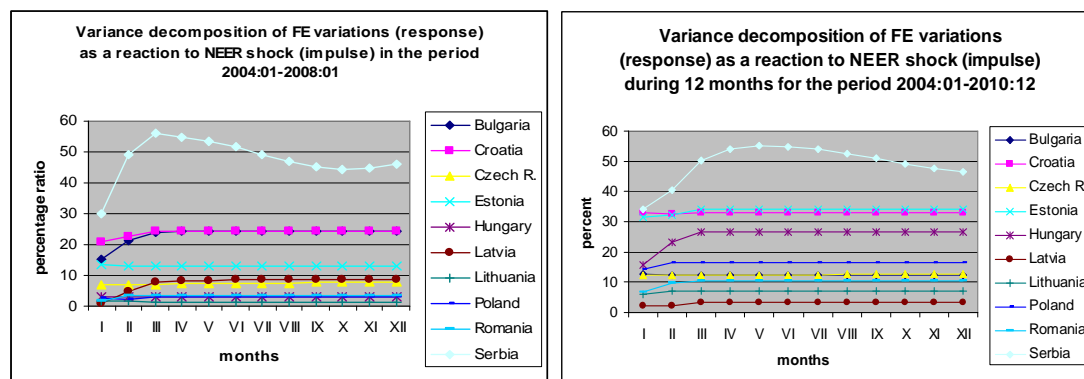
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<sup>11</sup> We also examined the influence of terms of trade shock (trade channel of crisis transmission), expressed as influence of gross terms of trade (as a ratio of export and import level) shock to national industrial production variations and real exchange rate variations in selected EEC in the period 2004:01-2010:12. Although we expected that the ratio of terms of trade shocks in explaining industrial production variations were higher/lower in the case of “fixers”/“floaters”, and that ratio of terms of trade shocks were higher/lower in explaining RER in the case of “floaters”/“fixers”, results were mixed and didn't offer adequate background for specific conclusions concerning practised ERR.

<sup>12</sup> However, as Frankel and Saravelos (2010) also highlighted, the foreign exchange reserves are under influence of other factors, not just the exchange rate. Mentioned fact is especially valid in crisis circumstances when a number of EEC raise FE reserves thanks to drawing credit under IMF programs. The second reason why results concerning the relation between FE reserves and NEER must be taken with the caution, is following: movements in ER cause important distortion in valuation of FE reserves. If the reserves are valued in US dollars in some countries, the data indicate large fall in the level of FE reserves for many EEC. Appreciation of USD during the crisis reduced the dollar value of reserves of EEC due to the large proportion of euros in their portfolios.



**Figure 18** Influence of NEER shock to FE variations (percentage ratio) for the period 2004:01-2008:01 (left graph) and 2004:01-2010:12 (right graph) in the case of selected EECs during 12 months



Source: Authors' estimations.

Observing the pre-crisis period at the left graph in Figure 18, the country ordering concerning the influence of NEER shock to FE variations is following: Serbia (30% in the 1<sup>st</sup> month - 52% in the 6<sup>th</sup> month - 44% in the 12<sup>th</sup> month), Croatia (21% in the 1<sup>st</sup> month - 24% in the 12<sup>th</sup> month), Bulgaria (15%-24%), Estonia (13%), Czech R. (7%-8%), Hungary (3%), Poland (3%), Romania (2%-3%), Lithuania (2%), Latvia (1%-9%). Comparison with the whole period (right graph) indicates that Serbia also mostly manage the exchange rate with the foreign exchange reserves in approximately same extent (rise from 30%-52%-44% to 34%-55%-46%). Concerning other cases, the foreign exchange interventions were raised in crisis period, either to defend the parity in the case of Croatia (rise from 21-24% to 33%), Estonia (rise from 13% to 31-34%), Lithuania (rise from 2% to 6-7%), or to limit depreciations in the case of floating regimes in Hungary (rise from 3% to 16-27%), Poland (rise from 3% to 14-17%) and Romania (rise from 2-3% to 7-11%).

## 5. Conclusion

The paper explores crisis impact to selected EECs in the light of practised ERRs. Fixed ERRs country group includes currency board and conventional pegs and it is comprised from three Baltic states, Bulgaria and Croatia. Flexible ERR includes *de facto/de jure* managed and free floating ERRs and it's comprised from Poland, Czech Republic, Hungary, Romania and Serbia. Emerging European Countries were hit with external financial and trade shocks, since export volume dropped, as well as inflow of FDI, portfolio investments, and remittances. Having in mind current account deficits prevalent in the pre-crisis period, the economic growth of EECs was externally financialized which was abruptly reversed due to the "sudden stop" and trade shocks. Economies under fixed ERRs pass through internal devaluation i.e. nominal wage and price decrease with accompanying sacrifice in the real economy. Baltic states were mostly hit by crisis expressed with GDP level fall and unemployment rise in accordance with the process of internal adjustment mechanism under rigid (currency board) regimes. From the other side, flexible ERR country group used the

exchange rate as a shock absorber, hence allowed nominal ER depreciations with buffering effect to the real economy.

Our results of exploring the crisis transmission to the real economy of investigated EECs point to the fact that the influence of shock in industrial production of G7 group was higher in the period that included crisis quarters, compared to the pre-crisis period. Overall, results indicate that countries with flexible ERRs benefited from shock absorbing role since these economies were relatively more exposed to the shocks in industrial production of developed G7 economies (Hungary, Czech Republic, Poland, Romania). Croatia and Serbia are in the middle concerning vulnerability to real external shocks, while Estonia, Bulgaria, Latvia and Lithuania were the least vulnerable to external real shock.

Real exchange rate provides one of the adjustment mechanisms in the medium and long run under both ERRs, fixed and flexible. If ERR is fixed, RER adjusts through movements in foreign and domestic price levels. If ERR is flexible, RER adjusts mainly through NER movements. The percentage ratio of price and NER shocks in explaining RER variations confirms theoretical argumentation related to the role of exchange rate as a shock absorber. The results indicate that in the fixed ERR country group, RER variability is mostly influenced via CPI shock or variations. Competitiveness is improving gradually through price lowering within deflationary adjustment mechanism. Contrary to fixed ERRs, in the case of “floaters“ RER variations are dominantly explained with NER shocks. Accordingly, the RER variations are automatic, competitiveness is faster improved, with the absorbing effect to the real economy. There is no significant difference in results comparing pre-crisis period and the whole explored period.

Having in mind the fact that in all ERRs are used foreign exchange reserves either to defend the parity or to mitigate ER fluctuations, the ratio of NER shock in explaining foreign exchange variations has been tracked. Analysing the extent in which foreign exchange variations are explained with NER shock in the pre-crisis and the whole period, it should be noted that the foreign exchange reserves were more used to defend/mitigate the ER in the whole period which comprises crisis impact. Besides the fact that foreign exchange interventions are more intensively used in the crisis period, which is expected, the ratio of NER shock in explaining foreign exchange variations points to the conclusion that both group of countries used direct interventions, “fixers” and “floaters”. In this case, distinguishing results from the viewpoint of practised ERR cannot be drawn. Emerging European Countries with flexible ER and relatively stronger managing of ER fluctuations limit the shock absorbing role of an ER, thus practising some kind of a hybrid ERR with the combined role of an ER as nominal anchor and shock absorber.

Although ERR and associated adjustment mechanisms are relevant for exploring the impact of crisis to EECs, the transmission of external shocks should be analysed in a more broader context by exploring specific vulnerability points of EECs based on case studies. Besides practised ERR, an impact of external shocks in further research should be connected with selected pre-crisis indicators and indicators of global linkages which together shape the national economic response.

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## APPENDIX

**Table 1** ERR in Emerging European Countries (EECs) in the period 1990-2010

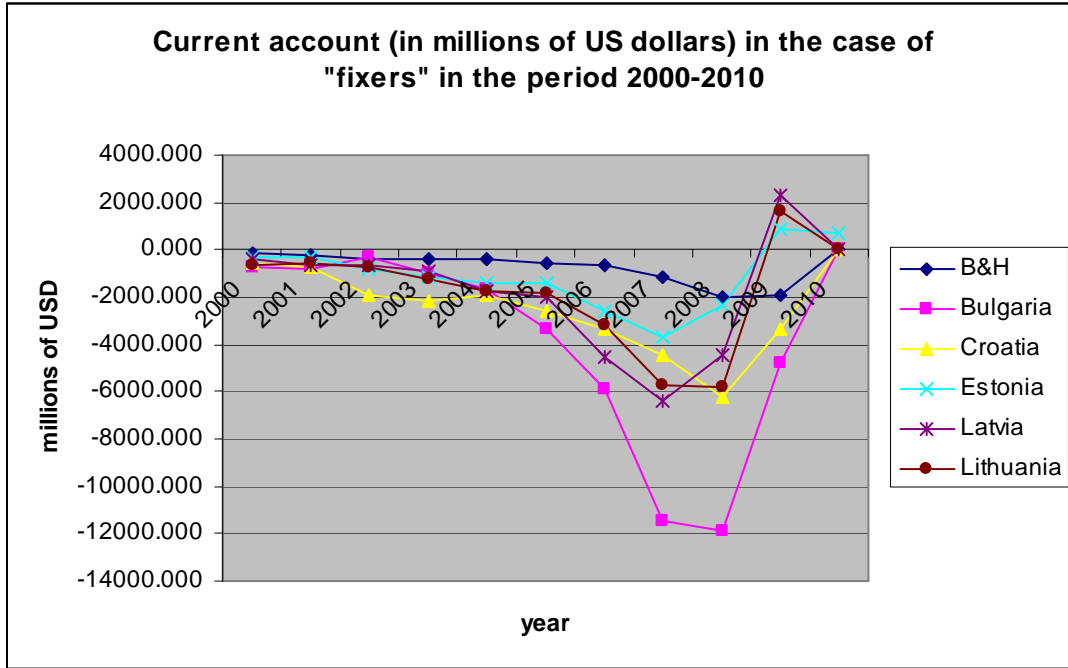
Emerging European Country	Currency board	Conventional fixed peg	Adjustable peg	Crawling peg	Crawling corridor or a target zone	Managed floating	Free floating	Target zone ERM II	Monetary union (EMU)
	<i>Rigid regime</i>	<i>Intermediate regimes</i>				<i>Flexible regimes</i>		<i>Intermediate regimes</i>	<i>Rigid regimes</i>
Estonia	1992:06							2004:06	2010:01
Lithuania	1994:03							2004:06	-
Latvia	1994:02 <i>De facto</i>	1994:02 <i>De jure</i>						2005:04	-
Slovenia						1994:01-2004:06		2004:06	2007:01
Poland			1990:01-1991:10	1991:10-1995:05	1995:05-2000:04	2000:04 <i>De facto</i>	2000:4 <i>De jure</i>	-	-
Czech Republic		1990:01-1993:05			1996:02-1997:05	1997:05		-	-
Slovak Republic		1990:01-1993:05			1997:01-1998:10	1998:10-2005:11		2005:11	2009:01
Hungary				1994:01-2001:05	2001:05-2008:02	2008:02 <i>De facto</i>	2008:02 <i>De jure</i>	-	-
Bulgaria	1997:07					1990:01-1997:07		-	-
Romania		1992:01	1998:01			2004:01 <i>de facto;</i>		-	-

						<i>Since 1992:01 de jure</i>			
Serbia		<i>2000:10- 2003:01</i>		<i>2003:01- 2006:09</i>		<i>2006:09  (de jure since 2000:10)</i>			
Albania						<i>1992:01</i>			
B & H	<i>1997:01</i>								
Croatia		<i>1994:01  De facto</i>				<i>1993:01 de jure</i>			
Macedonia		<i>1993:05  De facto</i>				<i>1993:05 de jure</i>			
Montenegro									<i>2002: 01 (formal euroization)</i>

**Note:** In the case of distinction between *de jure* and *de facto* ERR it is clearly emphasized; otherwise, it is assumed that the country *de facto* use stated regime;

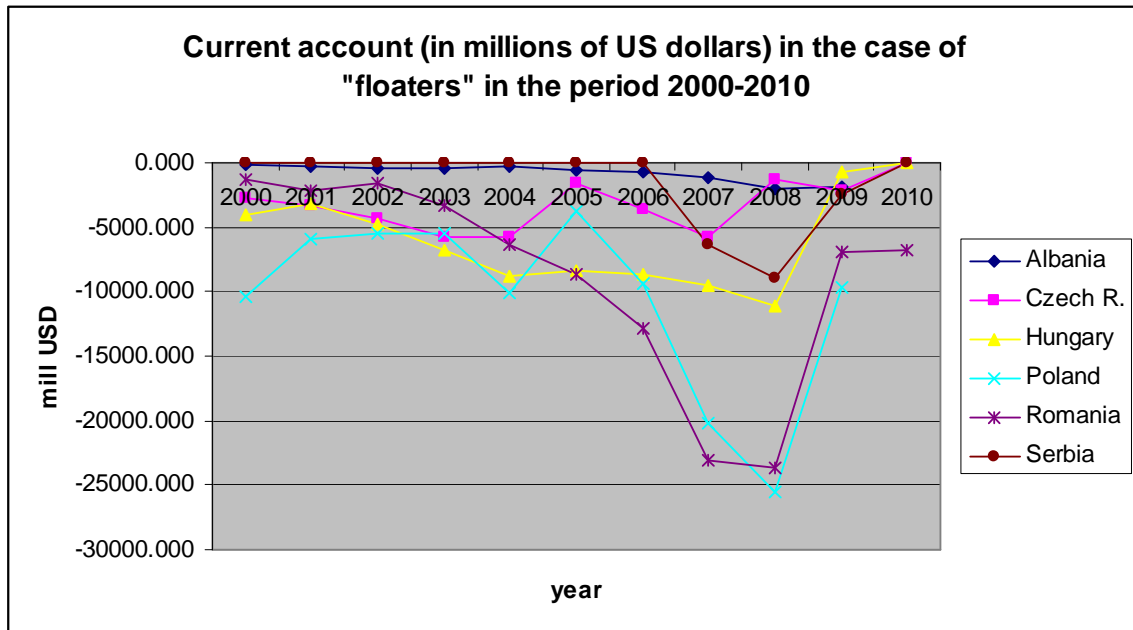
**Source:** The authors.

**Figure 1** Current account balance (in millions of US dollars) in Estonia, Lithuania, Latvia, Bulgaria, Bosnia & Hercegovina, Croatia, in the period 2000-2010



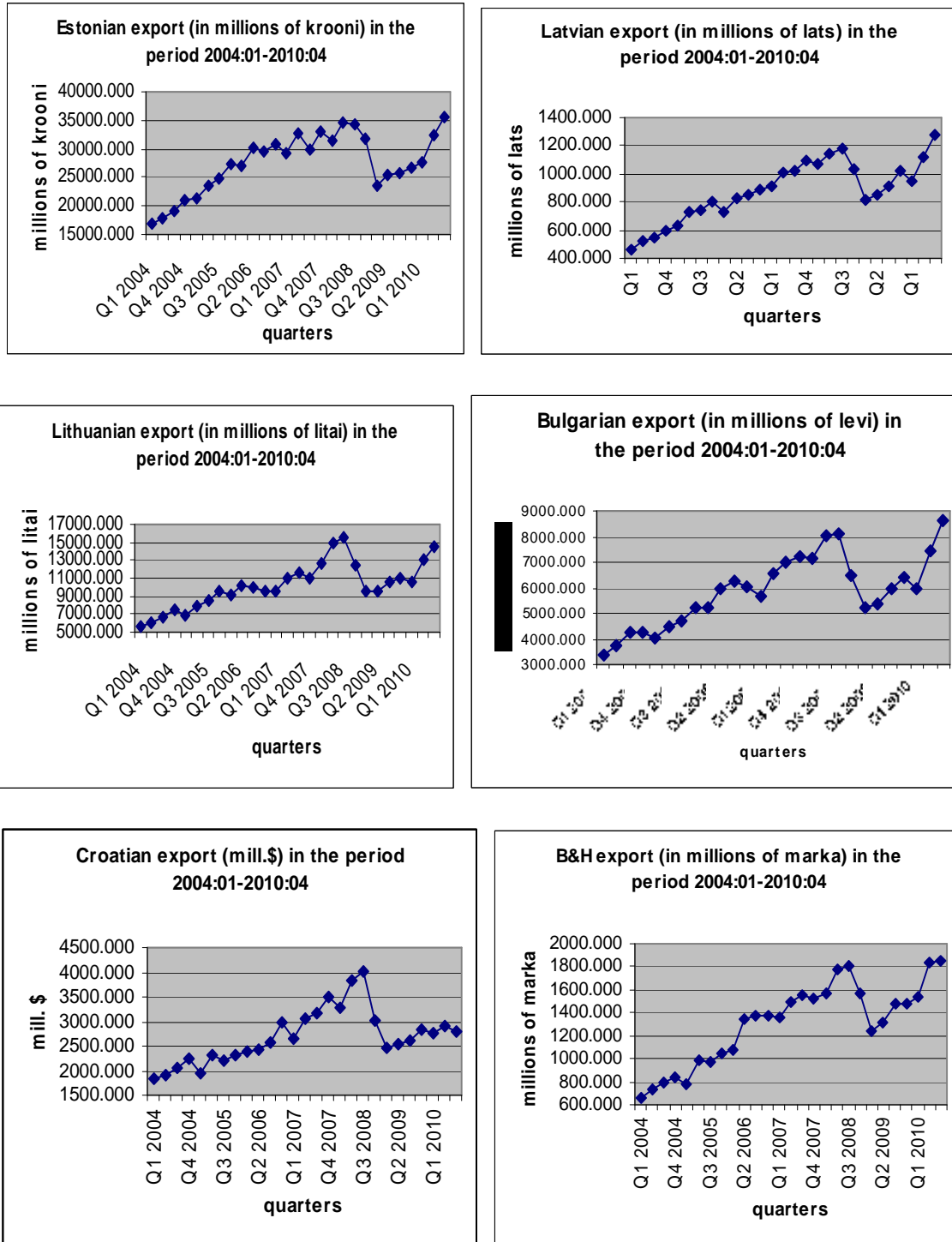
Source: Authors' review according to IFS yearly data.

**Figure 2** Current account balance (in millions of US dollars) in Poland, Czech Republic, Hungary, Romania, Serbia, Albania, in the period 2000-2010



Source: Authors' review according to IFS yearly data.

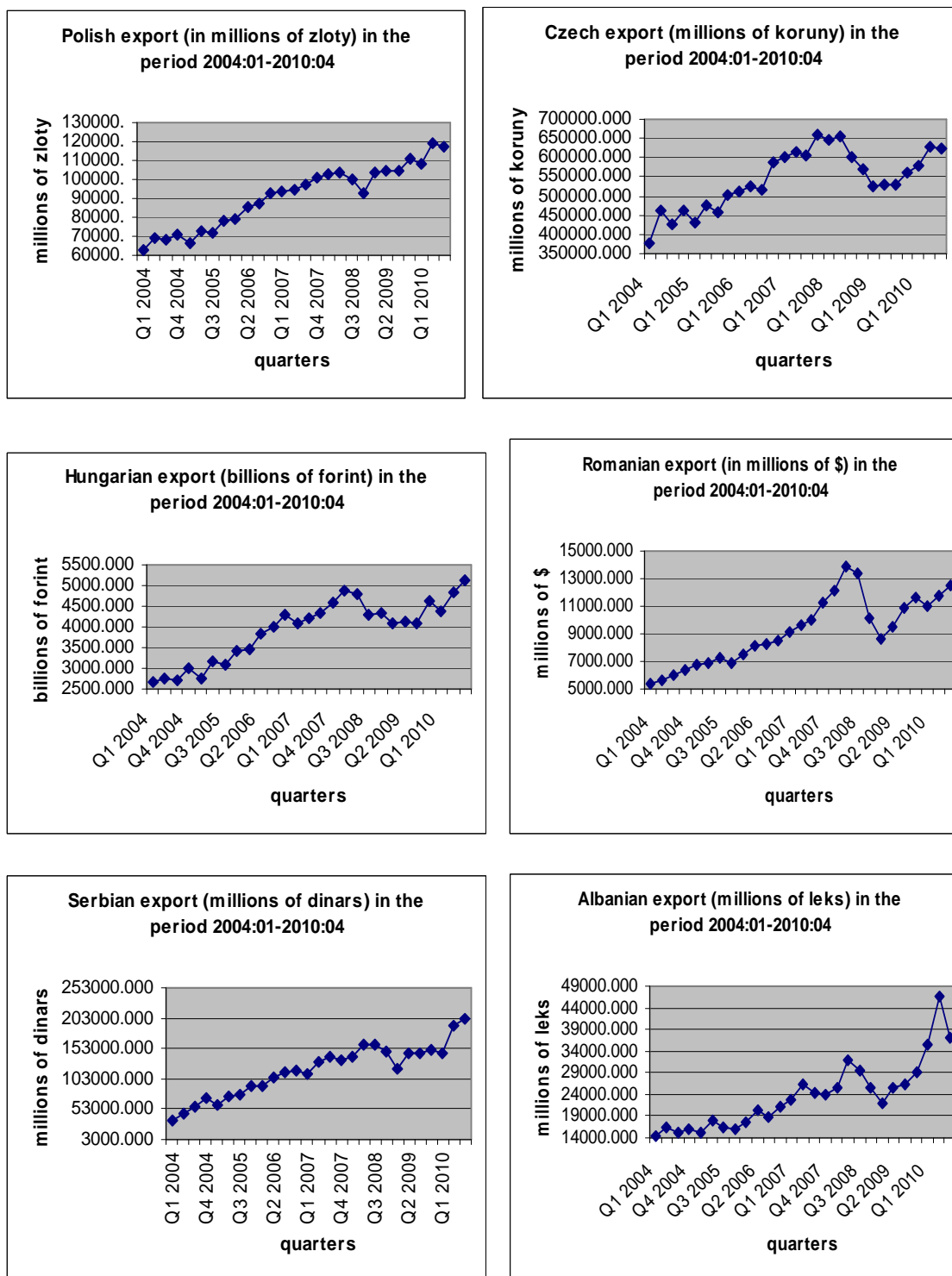
**Figure 3** Export level (in millions of national currency or US dollar) in Estonia, Lithuania, Latvia, Bulgaria, Bosnia and Hercegovina, Croatia, in the period 2004-2010



Source: Authors' review according to IFS quarterly data.

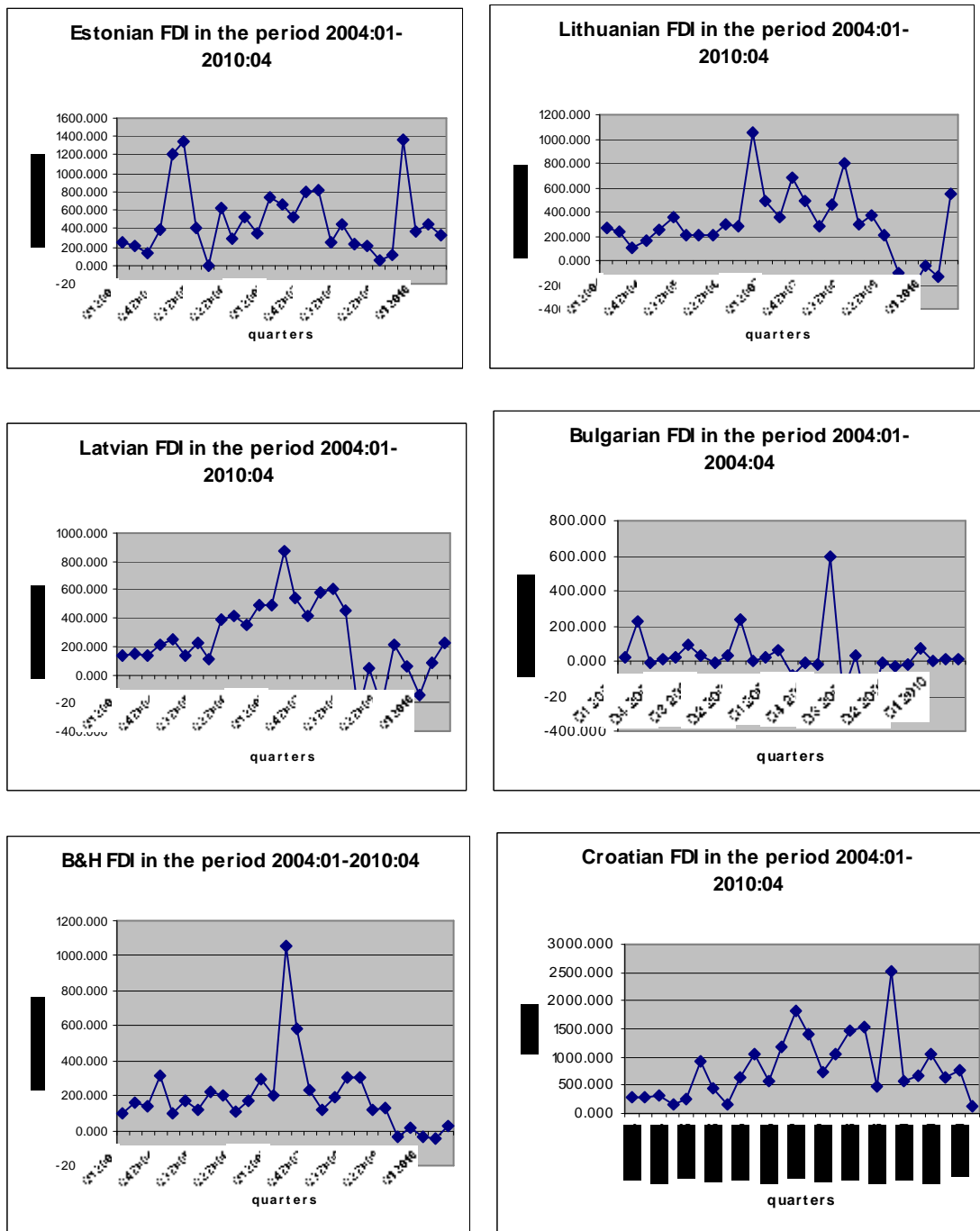


**Figure 4** Export level (in millions of national currency or US dollar) in Poland, Czech Republic, Hungary, Romania, Serbia, Albania, in the period 2004-2010



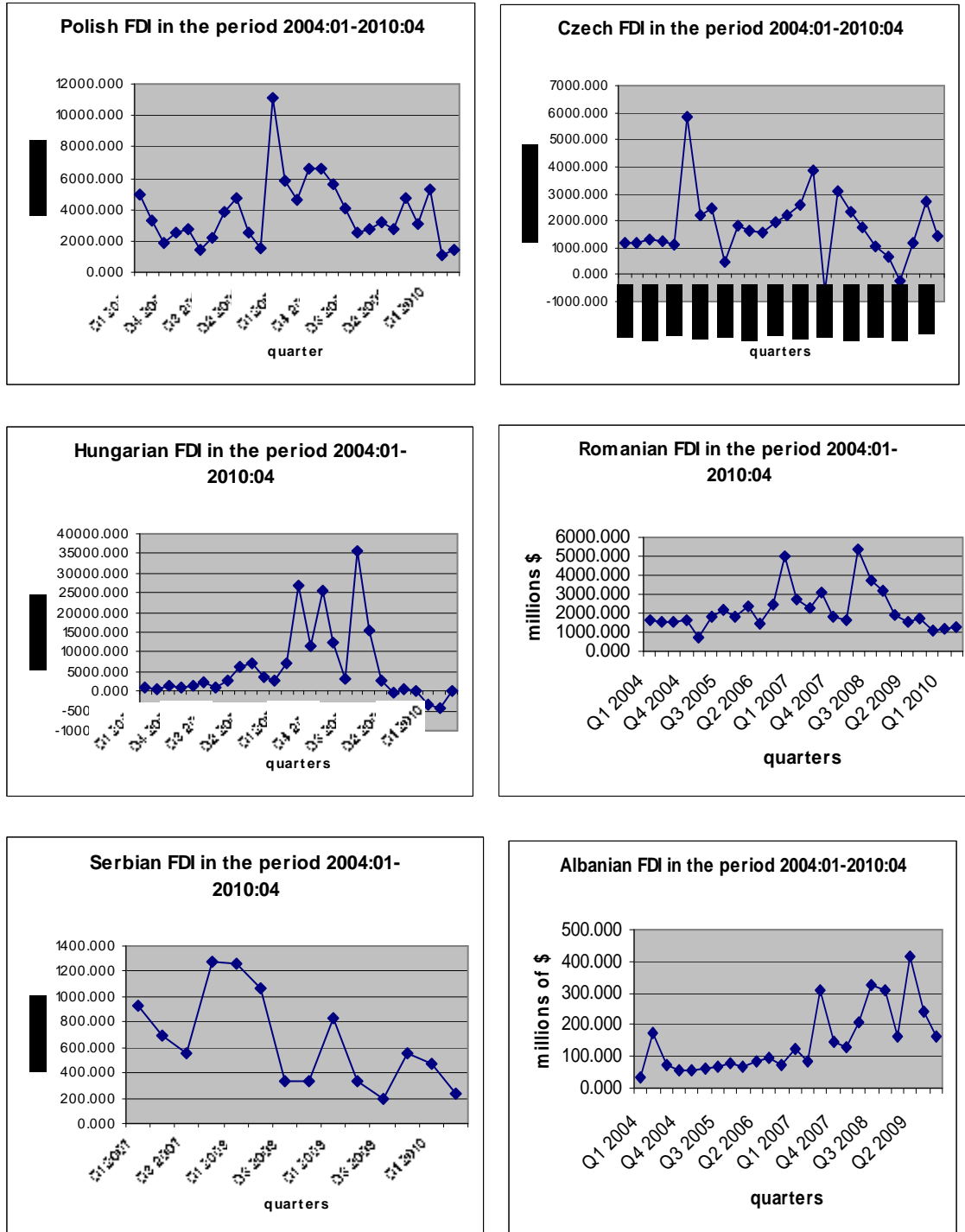
Source: Authors' review according to IFS quarterly data.

**Figure 5** FDI (in millions of US dollar) in P, Czech Republic, Hungary, Romania, Serbia, Albania, in the period 2004-2010



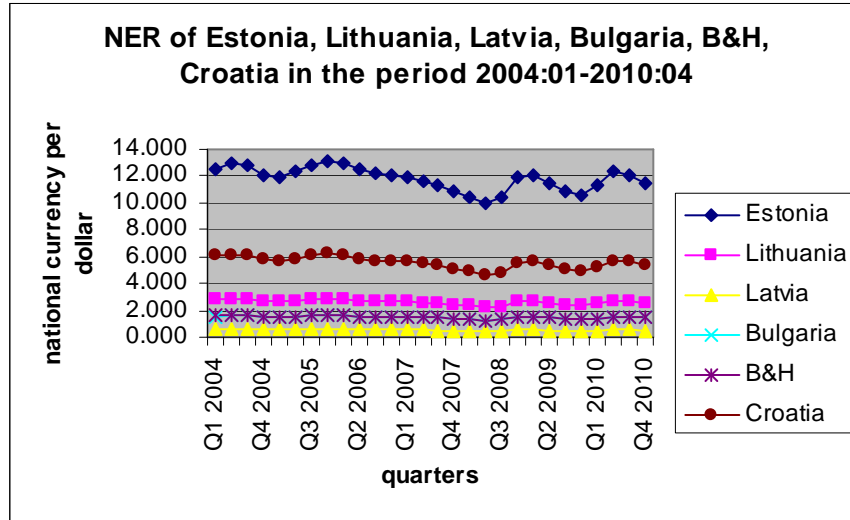
Source: Authors' review according to IFS quarterly data.

**Figure 6** FDI (in millions of US dollar) in Poland, Czech Republic, Hungary, Romania, Serbia, Albania, in the period 2004-2010



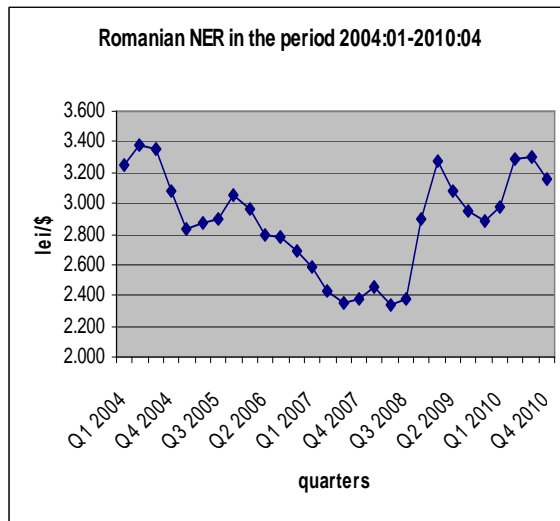
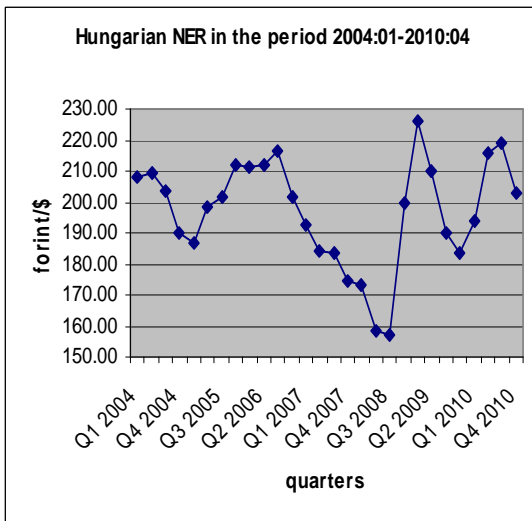
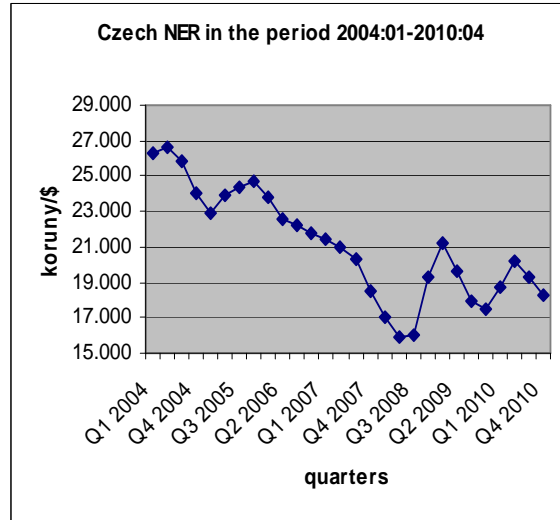
Source: Authors' review according to IFS quarterly data.

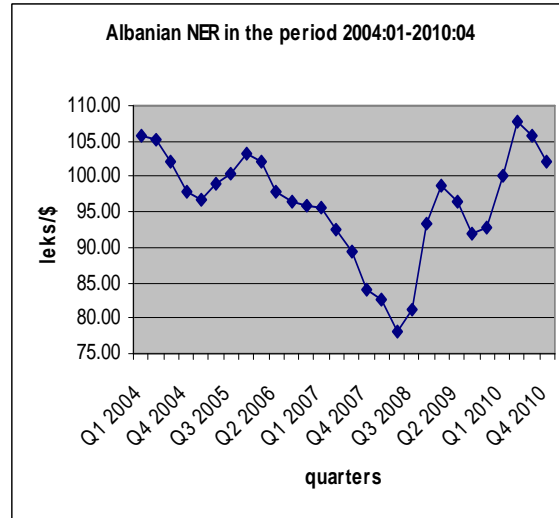
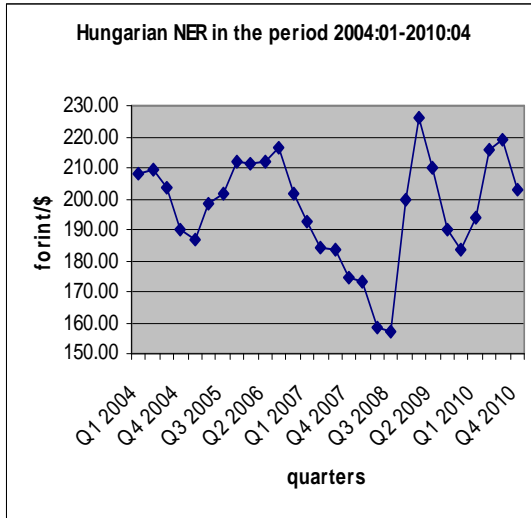
**Figure 7** Nominal exchange rate (directly noted as national currency per US dollar) of Estonia, Lithuania, Latvia, Bulgaria, B&H, Croatia, in the period 2004-2010



**Source:** Authors' review according to IFS quarterly data.

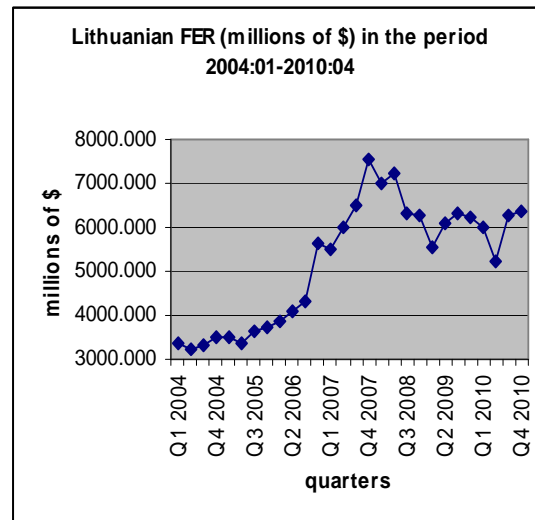
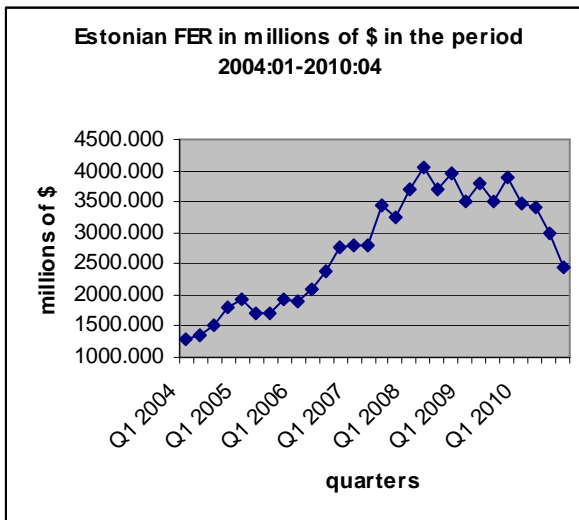
**Figure 8** Nominal exchange rate (directly noted as national currency per US dollar) in Poland, Czech Republic, Hungary, Romania, Serbia and Albania

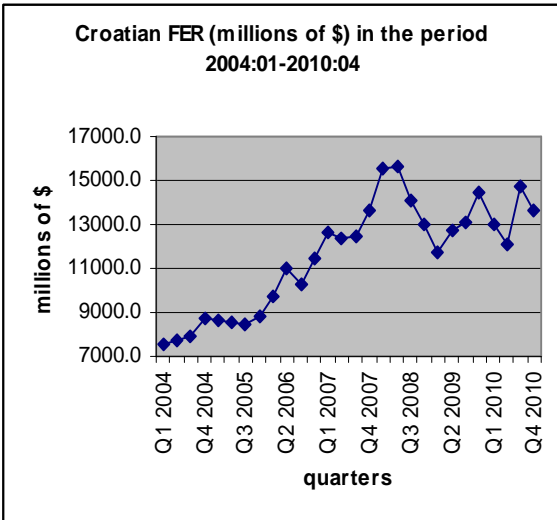
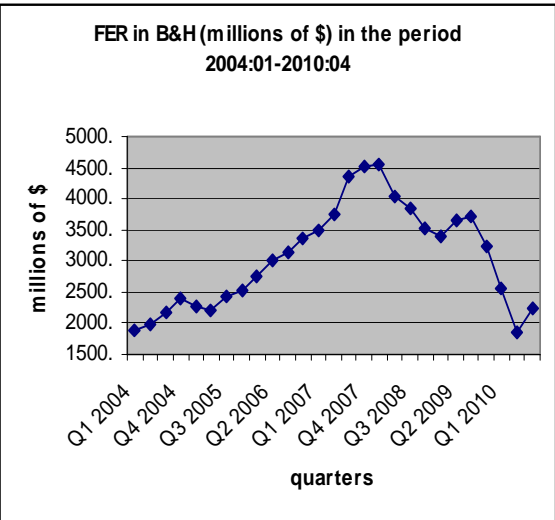
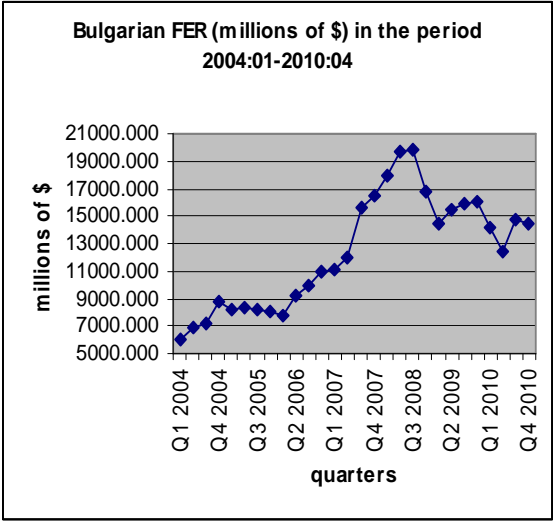
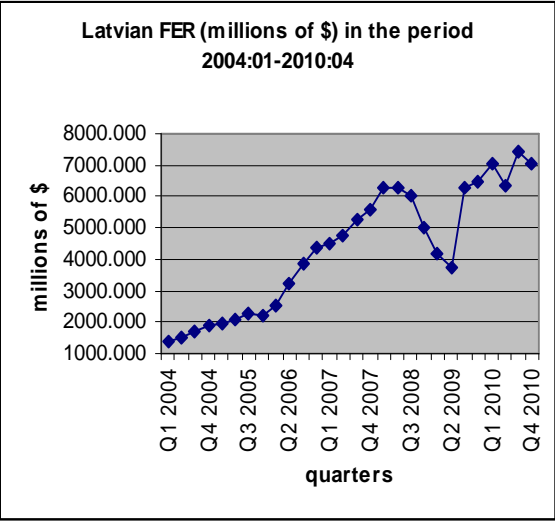




Source: Authors' review according to IFS quarterly data.

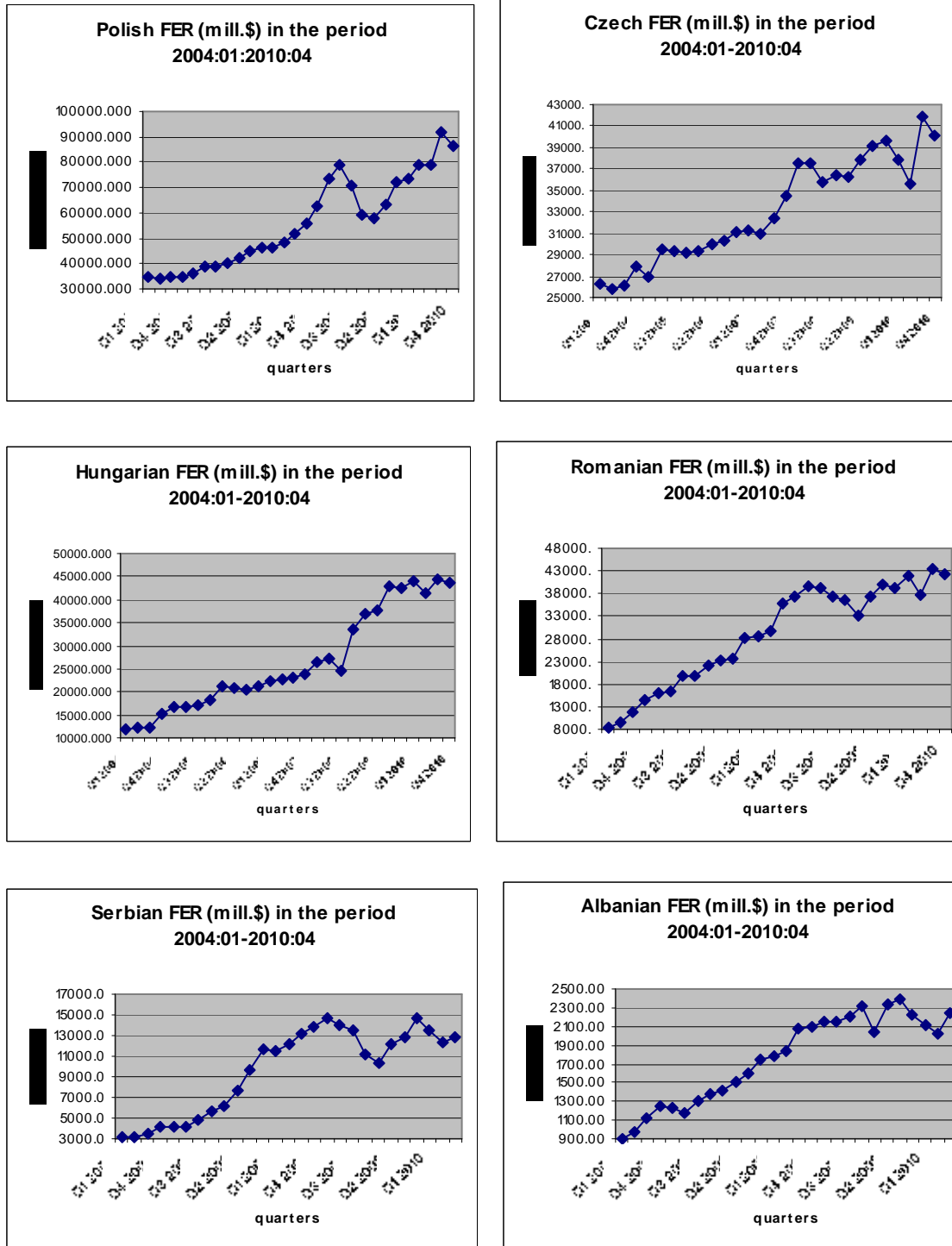
Figure 9 Foreign exchange reserves (in millions of US dollar) in Estonia, Lithuania, Latvia, Bulgaria, B&H, Croatia, in the period 2004-2010





Source: Authors' review according to IFS quarterly data.

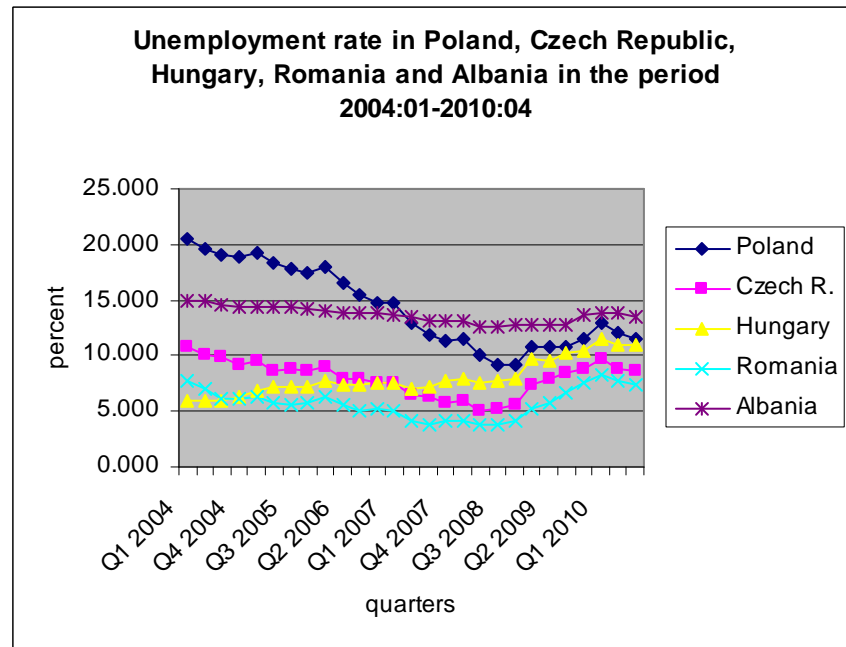
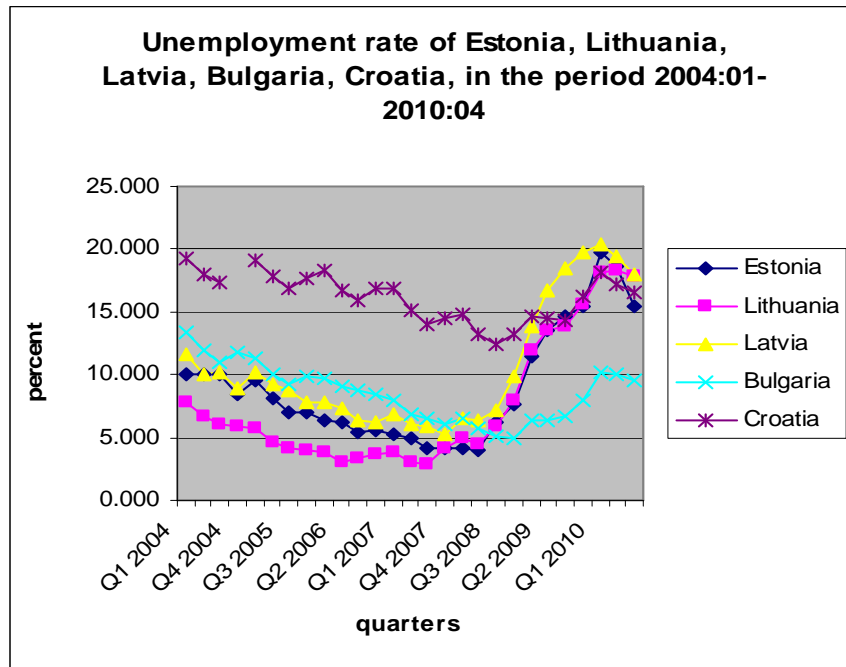
**Figure 10** Foreign exchange reserves (in millions of US dollar) in Estonia, Lithuania, Latvia, Bulgaria, B&H, Croatia, in the period 2004-2010



Source: Authors' review according to IFS quarterly data.

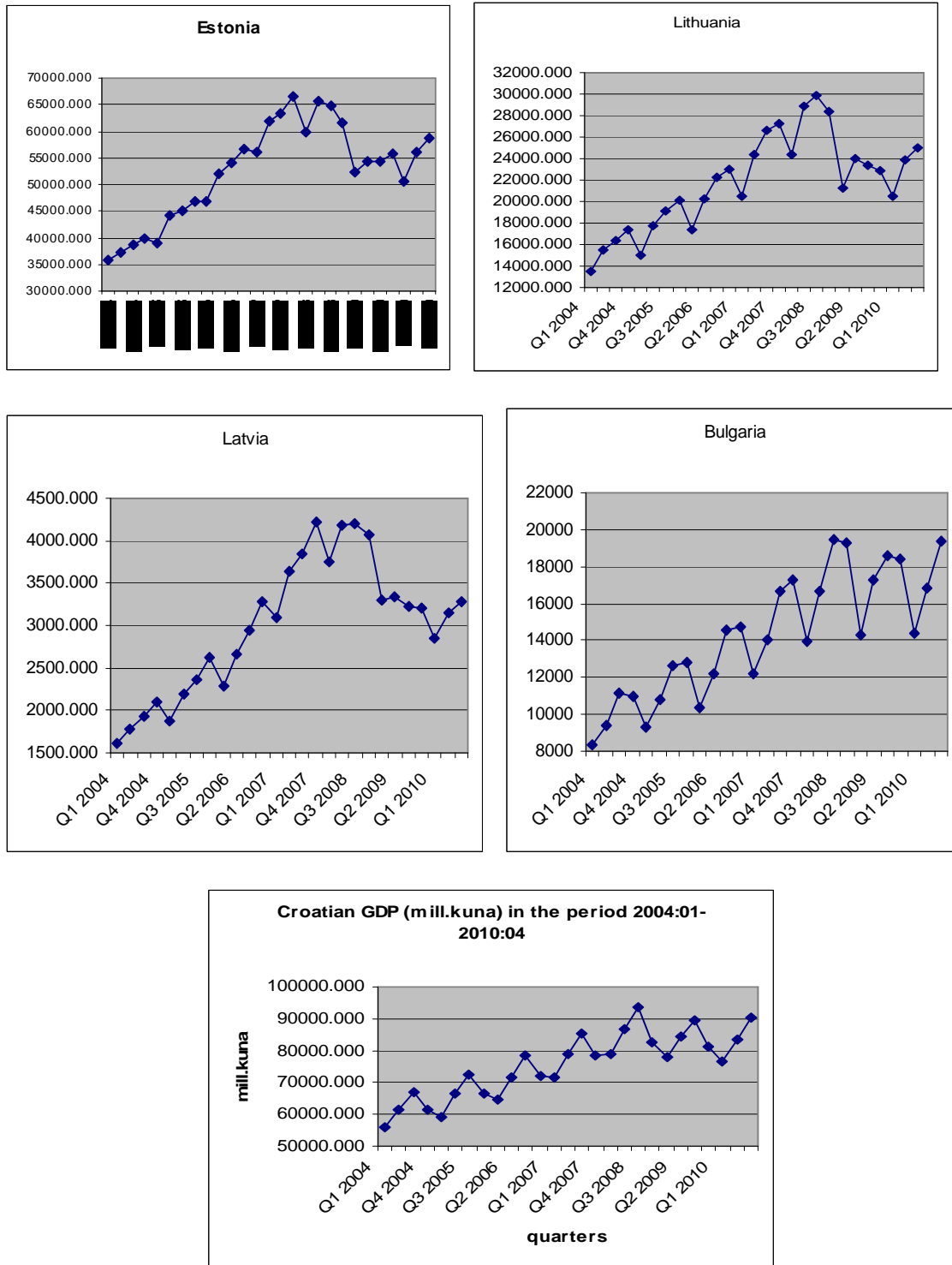


**Figure 11** Unemployment rate in fixed ERRs (Estonia, Lithuania, Latvia, Bulgaria, Croatia) and flexible ERRs (Poland, Czech Republic, Hungary, Albania) in the period 2004-2010



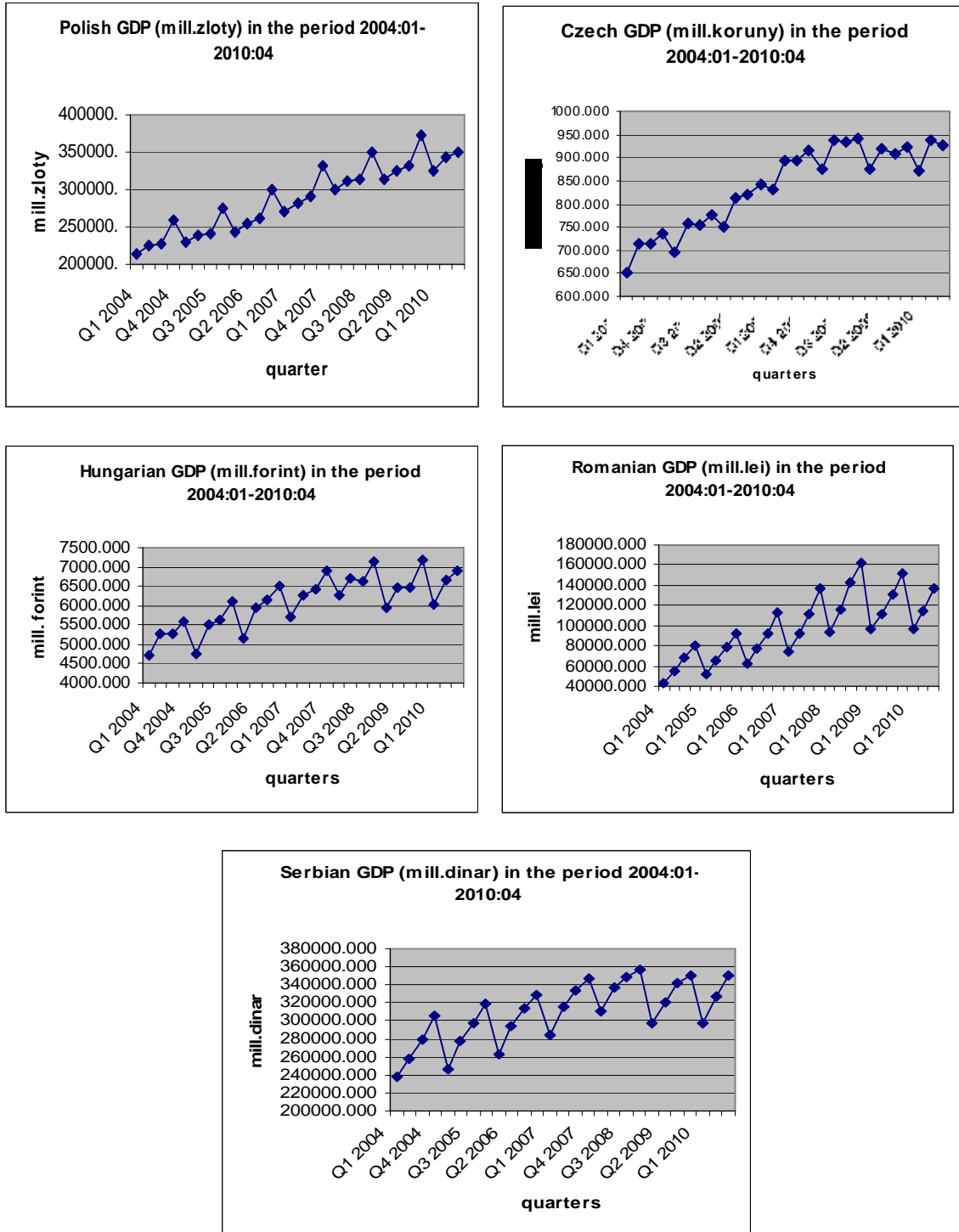
Source: Authors' review according to IFS quarterly data.

**Figure 12** GDP (millions of national currency) in Estonia, Lithuania, Latvia, Bulgaria, B&H, Croatia, in the period 2004-2010



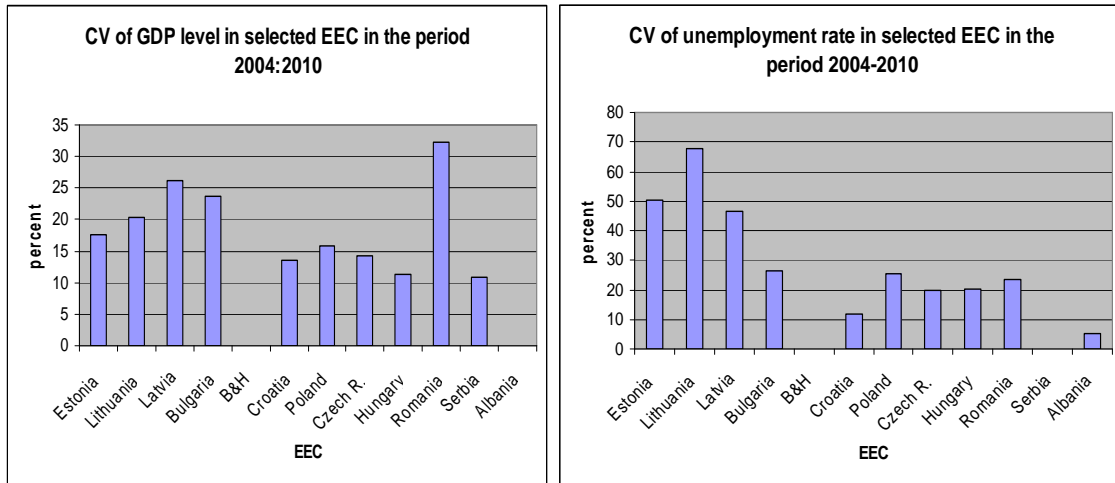
Source: Authors' review according to IFS quarterly data.

**Figure 13** GDP (millions of national currency) in Poland, Czech Republic, Hungary, Romania, Serbia, in the period 2004-2010



Source: Authors' review according to IFS quarterly data.

**Figure 14** Coefficient of variation (CV) of GDP level (left graph) and unemployment rate (right graph) in selected EECs in the period 2004:Q1-2010:Q4



Source: Authors' calculations.