Sustainable Real Exchange Rates in the New EU Member States: Is FDI a Mixed Blessing?

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Abstract

This paper focuses on various macroeconomic issues created by the foreign direct investment (FDI) inflows in the new member states (NMS). We question whether the macroeconomic performance of the NMS is furthered through the FDI's overall positive impact on the trade balance or whether it can actually worsen the performance. Our findings suggest that in some NMS the integration gain, foreseen by the financial markets, may be reflected in a sustainable appreciation of the real exchange rate. Such real appreciation is in most cases moderate enough to allow for smooth nominal convergence required for to the euro adoption. In some cases, however, this appreciation is very fast, especially in the NMS with a low net external debt and massive FDI inflows, making it challenging to fulfill the Maastricht criteria. The Maastricht criteria may be difficult to meet also in those NMS where FDI has been channeled predominantly into services, housing construction, or nontradable sectors in general. In these countries we observe increasing net external debt without a corresponding improvement in the trade balance and these economies might be required to depreciate their currencies in real terms to sustain the external balance.

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I. INTRODUCTION

In 2009 most of the twelve new member states (NMS), that joined the EU either in May 2004 (the Czech Republic, Cyprus, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia, and Slovenia) or in January 2007 (Bulgaria, Romania), were still in the process of catching-up to the EU level of development. This process has had serious implications for macroeconomic policies of the NMS, affecting both their sustainable real exchange rates (SRER) and the observed ones (RER). Drawing a comprehensive picture of the overall impact requires taking into account the national monetary frameworks (inflation targeting, hard pegs, and currency board) as well as the countries' speed of the accession to the euro (Slovenia, Cyprus, Malta, and Slovakia have adopted the euro already, while the rest are still at least a few years away from that ultimate objective).

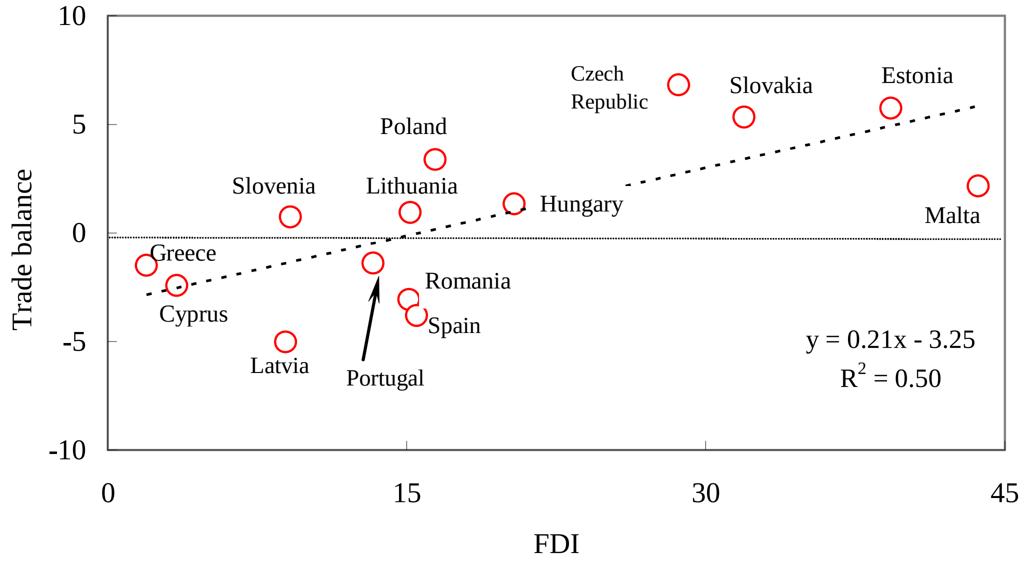
Our study is motivated by three selected stylized facts regarding the NMS and their real exchange rates. First, on average, these currencies appreciated by about 5 percent annually. Second, this appreciation either cannot be attributed to or it appears to contradict such frequently used justifications as excessive devaluation at the start of the transition process (Halpern and Wyplosz, 1997); significantly rising total factor productivity in the tradable-good sector due to the Balassa–Samuelson effect (Cincibuch and Podpiera, 2004); or the external wealth accumulation hypothesis according to which the NMS' sizable external liabilities require trade surpluses supported by a depreciated real exchange rate (Lane and Milesi-Ferretti, 2002). Third, the NMS have received massive inflows of foreign direct investment (FDI) that may have affected investors' perceptions about the countries' long-term sustainable external balances.

We suggest to used FDI to explain the observed real exchange rate appreciation, which is otherwise at odds with the traditional explanations. Providing that FDI contribute to export growth and productivity improvements, contemporaneous capital inflows signal future net export gains consistent with a long-lasting and sustainable real appreciation. Clearly, real appreciation is sustainable only to the extent the net export gains are sufficient to prevent the increase of net external debt above some safe threshold. The simple relationship between the increase in the stock of FDI and improvements in the trade balance in goods seems suggestive: the countries with large stocks of FDI export more than those with small stocks of FDI (Figure 1).

Fast FDI-driven appreciation may be a mixed blessing vis-à-vis the euro adoption, however. On the one hand, the NMS that attracted large FDI inflows are able to appreciate their currencies in real terms without jeopardizing their long-term growth prospects. On the other hand, it may complicate the adoption of the euro in these countries, as fast and sustainable medium-term real appreciation would conflict with the nominal convergence requirements set for the members of the economic and monetary union (EMU). Not all NMS have been faced with fast real appreciation, however, and moderate sustainable appreciation may be compatible with the EMU entry preparations, making FDI inflows, a pure blessing for the recipient country. More complex is the impact of nontradable-sector FDI: the recipient countries may face higher external debt and sizable current account deficits owing to income outflows without corresponding net export improvements. Such countries may view FDI as a curse when approaching the euro adoption.

Figure 1. FDI Payoff [1/]

(Changes in net FDI and in the goods trade balance, in percent of GDP)



Source: IMF *World Economic Outlook*, authors' calculations.

1/ On the horizontal axis is a difference between the stock of net FDI-to-GDP ratio in 2001-2007 and 1998-1999. On the vertical axis is a difference between the average trade balance in goods as a ratio to GDP in 2001-2007 and 1998-1999. The simple linear regression implies that a 1-percentage point increase in the stock of FDI corresponds to an improvement in the trade balance by 0.2 percentage points. The linear trend is not sensitive to outliers.

Monetary policy regimes have differed across the sample countries and we therefore group the NMS to see the potential impact of these regimes on the interaction between the SRER and FDI. To this end, we work with the following three groups. First, there are five inflation targeters, IT, (the Czech Republic, Hungary, Poland, Romania, and Slovakia) among the NMS that announce explicit inflation targets (see Table 1) and float their exchange rates. For these countries, real appreciation can be effected through either nominal appreciation, higher inflation, or both. However, the second channel is limited to about 1 percentage point differential between the national and European Central Bank (ECB), see Table 1. In addition, exchange rate volatility, associated with the IT regime, has implications for the EMU membership, typically requiring revaluations of the central parity of the ERM2. However, not all countries in this group are the full-fledged inflation targeters, some have employed what is called the inflation targeting "lite" strategy (Carare and Stone, 2003, and Stone, 2003). The lite targeters have a composite objective, typically an inflation target and an exchange rate stability objective and/or their inflation forecasts are not well anchored in a modeling framework. By intervening in the foreign exchange market they are likely to miss the inflation target more often, but their ERM2 chances could be enhanced by a more stable nominal exchange rate, the long-run real exchange rate dynamics being unaffected by the regime choice. Two outliers are worth mentioning. First, Romania is an IT latecomer, having targeted inflation only from 2005 and, hence, its stylized facts may not always correspond fully to those of the other countries. Second, although Slovakia is a eurozone member, it adopted euro only in January 2009 and so it is included in the IT group.

Table 1. Announced Inflation Targets

Country (Year of the IT introduction)	2008–09	2010 and beyond
Czech Republic (1998)	3.0 percent (±1 percent)	2.0 percent (±1 percent)
Hungary (2001)	3.0 percent (±1 percent)	3.0 percent (±1 percent)
Poland (1998)	2.5 percent (±1 percent)	2.5 percent (±1 percent)
Romania (2005)	3.8 percent in December 2008	Has not been announced
	3.5 percent in December 2009 (±1 percent)	
Slovakia (2001)	Close, but less than 2 percent	Close, but less than 2 percent
The euro area countries (1999)	Close, but less than 2 percent	Close, but less than 2 percent

Source: The websites of the Czech National Bank, Magyar Nemzeti Bank, National Bank of Poland, National Bank of Romania, Slovak National Bank, and the European Central Bank. Stone (2003) classified Hungary, Poland, Romania, and Slovakia as lite targeters. The Czech Republic is a full-fledged targeter. The ECB is not formally an inflation targeting central bank, however, it is generally seen as a sophisticated price stability targeter.

Second, there are four NMS (Estonia, Lithuania, Bulgaria, and Latvia) that operate under either a currency board or a hard-peg regime that has not been readjusted for a considerable period of time. These countries have thus only one channel through which their currencies can appreciate in real terms vis-à-vis the euro, namely a higher inflation differential. As a result, these countries are likely to have difficulties with the Maastricht criterion for inflation to which the policy response is a lot trickier than that to the volatile nominal exchange rates experienced by the inflation targeters.

Third, there are three recent entrants into the euro area (Slovenia, Cyprus, and Malta) among the NMS—the fourth eurozone member, Slovakia, adopted the euro only on January 1, 2009 and is thus included in the IT group instead. We add also three forerunners (Greece, Spain, and Portugal) to this group in order to draw on their experience when discussing the interaction of FDI and the SRER. These forerunners are the closest in their GDP levels to the NMS, while other EU members that were significant receivers of FDI, such as Ireland, were already too developed in the time when our sample starts to form a comparable group (Barry, 2000). The size of our sample is thus 15 EU countries when we analyze the stylized facts and 13 countries when we compute the SRER (the full data set is not available for Cyprus and Malta).

There are numerous approaches to assess the equilibrium real exchange rates. Empirical papers, especially those based on the time-series, single-equation approach, have been inconclusive with respect to the direction of currency misalignment. While currencies were find overvalued using one set of variables, they were often found balanced or undervalued in another. The puzzling ambiguity was explained by Driver and Westaway (2005), who found that alternative methods of computing equilibrium real exchange rates work with different time horizons and hence most of the differences can be explained away by the horizons of the individual studies. Long-term studies have found transition country currencies typically undervalued, whereas medium-term studies have found them mostly overvalued. By choosing different measures of external equilibrium or different speeds of disequilibrium adjustment, the resulting estimates of real equilibrium rates can change easily. Given that we want to address medium-term convergence of real exchange rate in foreign debt-sensitive economies, we chose rely on structural medium-term model of sustainable real exchange rates.

The starting point for our methodology is a theoretical framework that links FDI and the SRER. In the next step, we proceed to a simplified empirical model. Subsequently, we update the overview of the FDI flows/stocks, trade balances, and real exchange rates for our 15 sample countries. We then estimate the SRER model for our restricted sample of 13 EU countries based on an updated set of economic fundamentals comparable to our previous research: net external debt, the stock of net FDI, terms of trade, international interest rates, and domestic and external demand variables.[1] The set of economic fundamentals determining the SRER is broader than in the typical empirical study of developed, fully-integrated EU economies, namely, the stock of FDI is added to capture the effects of integration and convergence. To obtain a wide range of plausible SRER estimates we produce them using both the previously estimated elasticities of export and import equations as well as newly produced estimates and calibrations.

We estimate both the current misalignment—at end-2007—and future path for the SRER. First, we compute the indicator of misalignment that compares the SRER estimates with the observed values of the real effective exchange rates. This measure can be used to determine whether or not a certain group of the NMS is more prone to overvaluation or undervaluation of their domestic currencies.

Second, we project the SRER trajectory (conditional on the projection of the fundamental economic variables and on the assumption of the sustainable net external debt) five years ahead to pinpoint those countries that may have difficulties with stabilizing both inflation and the nominal exchange rate in the medium-term. One group of affected countries has a downward sloping, that is, appreciating, SRER trajectory implying either fast nominal appreciation, high inflation, or both. The other group has an upward sloping, that is, depreciating, SRER trajectory due to a negative integration gain, implying a need to either depreciate the domestic currency or deflate the domestic economy by limiting absorption.

Third, we subject our results to robustness tests related to estimated/calibrated parameters as well as to scenarios of projections of exogenous variables. This analysis results into interval estimates for both the misalignment indicators and SRER trajectories, allowing us to encompass the various NMS-relevant issues. For example the risk premium ought to decline once the NMS are approaching the EMU entry. A more difficult problem is that of determining the normative nature of the SRER, as it depends on the sustainable level of net external debt. Given the uncertainty of sustainable debt, we prefer to work with alternative debt trajectories, as opposed to a single targeted debt value. The robustness analysis also illustrates that the NMS may face a less favorable international trade environment than in the last decade, and hence the real appreciation trends observed so far may not continue in the forthcoming years. Specifically, the analysis shows the potential impact of the current financial crises on the NMS by estimating the impact of falling foreign demand on the SRER.

[1] See Babecký, Bulíř, and Šmídková (2008), Bulíř and Šmídková (2005 and 2007).

Somewhat paradoxically, unfavorable external demand developments are likely to limit the tensions between the preparatory process for the euro adoption and the integration gain in the most successful FDI recipients. Should the external trade environment become less advantageous for the NMS, slowing demand for their exports, the scope for the sustainable real appreciation may be limited, offsetting the strong positive impact of FDI on the trade balance.

We also find that positive FDI effects—the integration gain—are likely to be longer-lasting than the medium-term negative effects of misalignment and the periods of sharp sustainable real appreciation. If the impact of the initial, FDI-driven appreciation coincides with the preparatory process for the euro adoption, the integration-gain benefits may be limited in the medium term as the domestic currency may be pegged to the euro at an unfavorable rate or the costs of nominal convergence, that is, compliance with the Maastricht criteria, may be too high. After the period of medium-term adjustment, the integration gain may start playing a dominant role again. In this respect, the first wave of the euro adopters and forerunners, such as Portugal or Greece, provide useful lessons for the NMS.

The paper is organized as follows. Section II presents stylized facts regarding the NMS and the control group of the forerunners, the euro area members that introduced the euro prior to the EU 2004 enlargement. Section III discusses various approaches to analyzing the interaction of the FDI and real exchange rates, including the SRER methodology that is the focus of this paper. Section IV outlines a macroeconomic model of the real exchange rate and capital stock determination and its empirical counterpart. Section V describes the data set, the model calibrations and underlying estimates. Section VI shows our empirical results for the SRER model of the NMS and the control group. Section VII concludes by suggesting some policy implications of our findings.

II. STYLIZED FACTS

Looking at our three groups of new member countries—inflation targeters (IT), exchange rate peggers, and euro-area members—we see that the stylized facts do not tell the same story for all the NMS, even though certain trends appear to be common across the whole sample. Our data sample starts in 1995 and goes to 2007 and we use several data sources, such as the IMF's *International Financial Statistics* and *World Economic Outlook*, EU's *AMECO*, NiGEM, and Eurostat.[2]

The first common trend is the appreciation of the real effective exchange rate. Annex I, Figure X1 and X2, shows two CPI-based real effective exchange rate calculations, one from the IMF and the other from NiGEM, both moving broadly in the same direction.[3] While all sample countries show some real appreciation during 1995-2007, the speed differs substantially across the sample and it does not seem to be correlated with the choice of a particular monetary policy strategy. Overall, the sample-period real appreciation ranged

[2] Detailed description of the data and additional results are available in the working paper version (see Babecký, Bulíř, and Šmídková, 2009).

[3] NiGEM is the large-scale quarterly macroeconomic model of the world economy created and maintained by the London-based National Institute of Economic and Social Research (http://www.niesr.ac.uk). The model is essentially new-Keynesian in its approach, in that agents are presumed to be forward-looking in some markets, but nominal rigidities slow the process of adjustment to shocks. Linkages between countries take place through trade, financial market interactions, and movements in international stocks of assets.

between 10 percent in the forerunner countries and the early entrants into the eurozone, and 40-80 percent in the hard-peg and IT countries. Only Slovenia's estimates differ between the two data sources: while the NiGEM estimate shows a sizable gain in competitiveness (real depreciation) during 2003-07, the IMF estimate shows a marginal loss (real appreciation), the difference being most likely in the definition of the effective nominal exchange rate, each source presumably using a different trade matrix.

Without considering sustainable real appreciation, one would expect that the countries with greater real appreciation suffer from a sizable loss in price competitiveness, resulting in large trade deficits and thus endangering their long-run growth prospects.[4] In reality, however, the sample real GDP growth averaged 5 percent in 2001-07, with only Portugal and Malta lagging significantly. In contrast, the Baltic states, Bulgaria, Romania, and Slovakia grew significantly faster than the average. In constant US dollar per capita terms all countries showed fast growth, for example, in the Baltic states the GDP per capita quadrupled between the early 1990s and 2007. Real appreciation in the NMS apparently did not affect negatively real growth, in part owing to moderate unit labor cost (ULC) growth. The patter growth of ULC needs to be separated into the "volatile" 1990s and "stable" 2000s. During 2001-07 ULCs either remained stable or declined marginally in our sample countries, the only notable exception being Romania.

With respect to the trade balances, the modest real appreciation in the forerunner countries and the early entrants into the eurozone seems to worsen their trade balances only marginally (Figure 2, upper pannel). Whereas sizable real appreciation in countries with hard pegs seemed to have worsened their trade balances significantly (most notably in Bulgaria from a small surplus in 1996-97 to staggering -25 percent of GDP in 2007), comparable real appreciation among inflation targeters had no visible negative impact on their trade balances and these actually improved in all of them but Romania, the late convert to inflation targeting.

Current account balances deteriorated in most sample countries during 2001-07 and this deterioration was particularly pronounced in Spain and Greece and among hard peggers, the latter showing deficits to the tune of 15-25 percent of GDP (Figure 2, lower pannel). However, the IT group (with the exception of Romania) stabilized current account deficits at around 5 percent of GDP or less, with Romania's deficit widening to almost 14 percent in 2007. To conclude, there is no clear bi-variate link between the speed of real appreciation and the size of trade and current account balances. The previous results suggest that we need to at additional factors behind the real appreciations to see why in some countries sizable appreciations seem sustainable from the point of view of the external balance, while in others they lead to sizable external deficits. We will argue that FDI inflows may explain a substantial part of this puzzle.

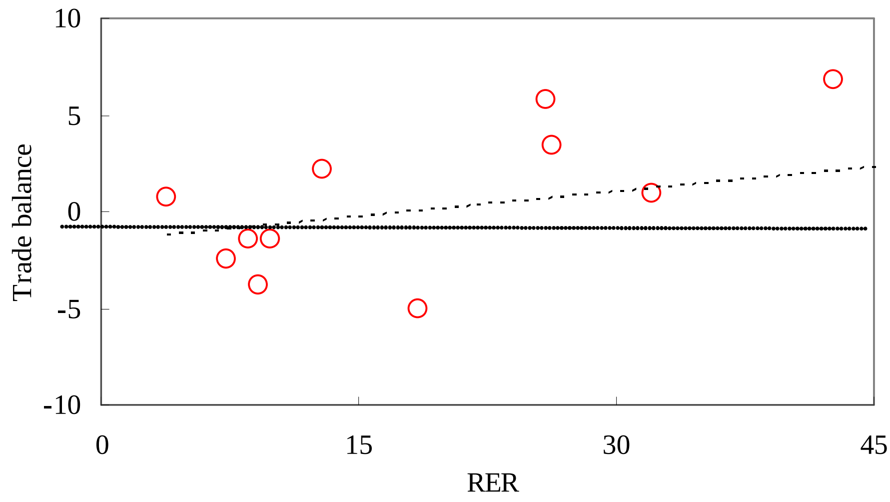
The stock of foreign direct investment grew fast in all countries, with the exception of Greece. However, only seven countries accumulated a stock of inward FDI in excess of

[4] All available estimates of the Balassa-Samuelson effect and its resulting impact on the productivity growth are too small to explain the appreciation phenomenon.

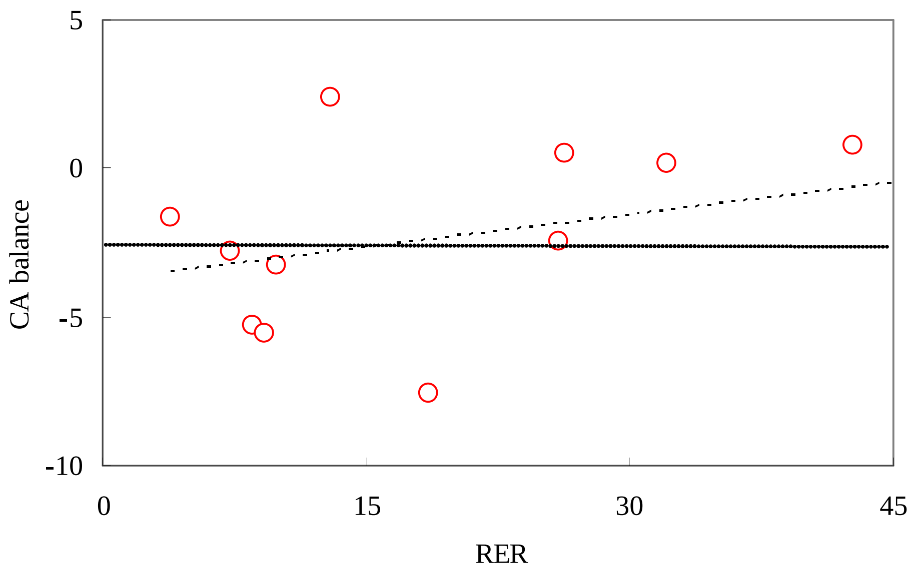
50 percent of GDP and they belong to all three groups—the eurozone, hard peg, and IT: Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Malta, and Slovakia. Six countries accumulated FDI equivalent to 25-50 percent of GDP, and two countries equivalent to 15-25 percent of GDP. A similar grouping arises when one looks at the increase in the FDI-to-GDP ratio in the aftermath of the 1997-1998 crisis. Seven countries (Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Malta, and Slovakia) attracted new FDI equivalent to 30 percent or more of GDP from 1998 to 2007 (Table 2). It appears that the potential integration gain from FDI accumulation is related to neither a particular monetary policy strategy nor a particular exchange rate regime. If anything, there is some weak evidence that inflation targeters and countries outside the euro area were more successful in attracting FDI. At the same time, countries that attracted more FDI seem to exhibit comparatively faster real appreciation and smaller trade deficits, suggesting that such real appreciation might have been sustainable.

Figure 2. Real Appreciation Was Consistent with External Balance Improvements

Changes the goods trade balance, in percent of GDP, and in RER, in percent 1/



Changes the current account balance, in percent of GDP, and in RER, in percent 2/



Source: *World Economic Outlook*, authors' calculations.

1/ On the horizontal axis is real effective exchange rate appreciation (in percent) during 1998-2007, while on the vertical axis is a difference (in percentage points) between the average trade balance in goods as a ratio to GDP in 2001-2007 and 1998-1999. The linear trend is not sensitive to outliers.

2/ On the horizontal axis is real effective exchange rate appreciation (in percent) during 1998-2007, while on the vertical axis is a difference (in percentage points) between the average current account balance in goods as a ratio to GDP in 2001-2007 and 1998-1999. The linear trend is not sensitive to outliers.

Table 2. Recipients of FDI Inflows

Country and monetary policy regimes (in brackets)	Increase in inward FDI in 1998- 2007 (% of GDP)
Malta (3)	78
Hungary (1)	67
Slovak Republic (1)	59
Bulgaria (2)	55
Estonia (2)	54
Cyprus (3)	39
Czech Republic (1)	38
Romania (1)	30
Poland (1)	27
Lithuania (2)	26
Portugal (3)	24
Spain (3)	19
Latvia (2)	17
Slovenia (3)	15
Greece (3)	7

Source: *World Economic Outlook*, authors' calculations.

Monetary policy strategies are defined as follows: 1 = inflation targeters, 2 = hard-peggers, 3 = euro area members, both forerunners and recent entrants.

Non-sterilized FDI inflows increase foreign indebtedness of the recipient-country as they have a corresponding foreign liability counter entry. If, however, the central bank sterilizes FDI, the net foreign asset position should be broadly unaffected by the changes in the stock of FDI (Figure 3, upper panel). With the exception of Malta, all countries have had negative net foreign assets positions during the sample period, however, these positions declined sharply only in the forerunner countries (Greece, Portugal, and Spain) and Latvia, while remaining constrained in others. At the same time, large FDI inflows were sterilized as can be seen in higher foreign exchange reserves (Figure 3, lower panel). Thus, it does not seem that FDI inflows jeopardized the external debt position of our sample countries and one can model sustainable net external positions independently from the FDI flows.

If it is not the FDI inflows that deteriorate the countries' NFA positions, what other factors could be behind such developments? We suggest that there are two factors worth considering. First, private sector credit expanded fast, especially among the hard peggers, reflecting the consumption and investment booms financed by current account deficits in these countries[5] and further stimulated by house price booms (Mihaljek and Égert, 2007). In contrast, however, both current account deficits and real estate booms were less pronounced among inflation targeters. Second, government deficits contributed to the increase in external debt, especially among inflation targeters. On average, central government balances consolidated, however, these improvements were related to the cyclical position of the sample economies during the mid 2000s: while some of the hard peggers ran sizable

[5] Note that the decision to borrow seemed optimal before the 2008 crisis: with much improved projections of steady-state output and consumption, the firms and households were simply attempting to smooth their investment and consumption profiles.

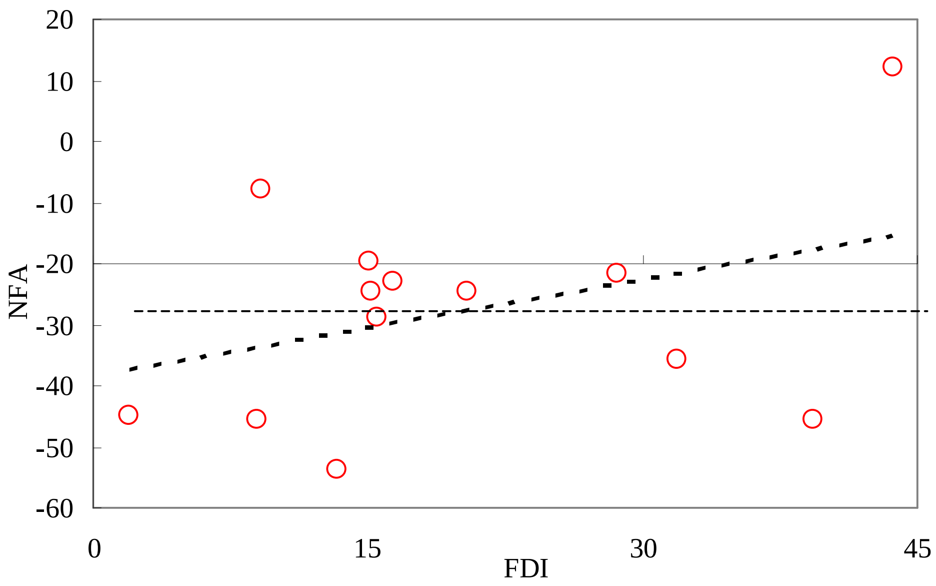
surpluses, all inflation targeters—with the exception of Hungary—ran gradually narrowing deficits.

The choice of the monetary policy strategy limits the scope for the two alternative channels to effect real appreciation. Inflation performance in our sample countries, when compared to their nominal effective appreciation rates, suggests which channels were more important for the respective groups (Table 3). While it is clear that there is a tradeoff between the two channels, and that countries with low inflation record exhibit stronger nominal effective appreciation than countries with high inflation, the link to the selected monetary strategy is far from straightforward, depending among other things on the duration and the relative success of the chosen strategy. Regarding the former, the Czech Republic introduced inflation targeting in 1998, while Romania in 2005. Regarding the latter, some peggers and inflation targeters managed to keep their year-on-year inflation below 5 percent on average during 1998-2007, while five sample countries recorded average inflation above 5 percent. Peggers brought inflation down quickly in the late 1990s, however, it accelerated above 5 percent in all of them in 2004 or shortly thereafter. Disinflation among inflation targeters was both more gradual and longer lasting—the only substantial acceleration in inflation in this group was recorder by Hungary.

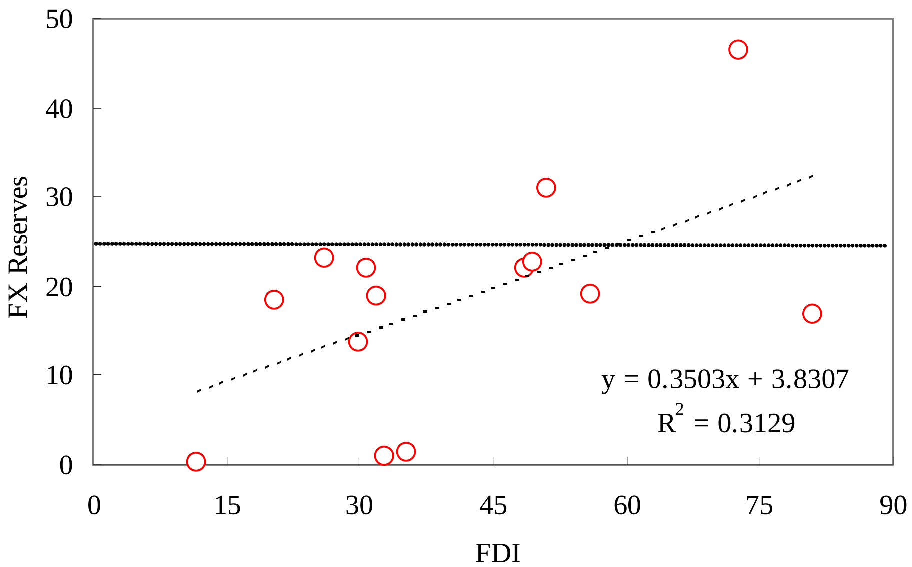
Figure 3. FDI Is Unrelated to Net External Debt,

Because FDI Recipients Sterilized the Inflows

Changes in net FDI and in Net Foreign Assets, in percent of GDP 1/



Stock of net FDI and Foreign Exchange Reserves, in percent of GDP 2/



Source: *World Economic Outlook*, authors' calculations.

1/ On the horizontal axes is the difference between the net FDI-to-GDP ratio in 2001-2007 and 1998-1999. On the vertical axis is a difference between the net foreign assets-to-GDP ratio in 2001-2007 and 1998-1999. The simple linear trend implies that a 1-percentage point increase in the stock of FDI corresponds to an improvement in NFA by 0.2 percentage points. However, after removing Malta from the sample, the linear trend becomes horizontal.

2/ On the vertical axis is the foreign exchange reserves-to-GDP ratio in 2007. The simple linear regression implies that a 1-percentage point increase in the stock of FDI corresponds to an improvement in FXR by 0.3 percentage points. The linear trend is not sensitive to outliers.

Table 3. Inflation and Exchange Rate Developments (1998-2007)

	Inflation
Romania (1)	25.51
Hungary (1)	7.53
Bulgaria (2)	7.43
Slovak Republic (1)	6.48
Slovenia (3)	5.66
Latvia (2)	4.67
Poland (1)	4.65
Estonia (2)	4.43
Greece (3)	3.34
Czech Republic (1)	3.33
Spain (3)	2.98
Portugal (3)	2.86
Cyprus (3)	2.54
Malta (3)	2.46
Lithuania (2)	2.22

	Average annual nominal effective exchange rate change (negative numbers imply nominal depreciation)
Romania (1)	-18.65
Slovenia (3)	-3.27
Latvia (2)	-0.82
Hungary (1)	-0.51
Greece (3)	-0.48
Bulgaria (2)	-0.35
Poland (1)	-0.02
Portugal (3)	0.12
Estonia (2)	0.16
Cyprus (3)	0.19
Spain (3)	0.37
Malta (3)	0.83
Czech Republic (1)	2.94
Lithuania (2)	2.99
Slovak Republic (1)	3.02

Information on monetary policy strategy used by each country is in brackets and the codes are as follows: 1 = inflation targeters, 2 = hard-peggers, 3 = euro area members (both forerunners as well as recent entrants).

All NMS are small open economies and as such are affected by international developments, such as world inflation and growth. Regarding the former, the 1990s and the first half of the 2000s were a period of a low inflation, stable food and commodity prices, and declining nominal interest rates.[6] Regarding the latter, solid growth in both the US and euro area favorably impacted the demand for sample country exports. The post-2007 environment is of course much more volatile. The real exchange rates in the NMS are affected by lower international inflation pressures, slowing foreign demand, and also by changes in the terms of trade. As a result, we need to test whether the strong influence that FDI apparently had on the RERs in 1990s (Bulíř and Šmídková, 2005; Bulíř and Šmídková, 2007) is not being offset presently by the impact of the other channels. The recent evidence, however, seems to refute such a hypothesis: Abiad, Leigh, and Mody (2007) suggest that in Europe capital and foreign direct investment in particular continue to "flow downhill," from relatively richer to relatively poorer countries.

III. Analyzing Real Exchange Rates and FDI in NMS

The NMS need to consider the interaction between real exchange rates and FDI inflows: real exchange rates will not stay stable during the process of country's integration into the EU that typically brings sizable FDI inflows. Neither can these countries mechanically assume that real exchange rate appreciation will be sustainable in the medium-term irrespective of the international environment. Our approach defines the SRER as a real exchange rate ensuring that net external debt is sustainable in the medium term, distinguishing real exchange rate changes due to fundamental factors such as foreign demand for exports, initial

[6] This period has been known as the Great Moderation (Giannone, Lenza, and Reichlin, 2008 and Hakura, 2009).

external debt, and FDI inflows from changes due to various short-term factors. Sustainability is a normative concept that depends on our definition of the steady-state level of net external debt—the more the current level of net external debt departs from its steady-state level, the more can the observed real exchange rate deviate from the SRER.

The SRERs belong to the class of models around the empirical concept of equilibrium (fundamental) real exchange rates (Williamson, 1994), which can be categorized by their sets of fundamental variables and different time horizons (Driver and Westaway, 2005). Our approach belongs to the medium-term methodologies that work with both stock as well as flow variables and in comparison to previously applied methodologies, we put emphasis on the role of FDI. Also, we implement country-specific definitions of sustainable external balance that reflect the fact that for given nominal appreciation countries with low initial net external debts and sizable FDI inflows can afford faster real appreciation in the medium-term, while countries with high initial debt levels or less FDI face higher risks of overvaluation. To this end, the SRER approach provides an aggregated framework for the interaction between the real exchange rates and FDI.

The SRER cannot explain several important issues and it needs to be supplemented with additional information. First, we need some hypotheses explaining persistent real appreciation in the NMS. Empirically, the Balassa-Samuelson effect has played a limited role (Cincibuch and Podpiera, 2004 and Égert, 2002). Global prices are becoming more important determinants of domestic price-setting behavior for nontradable goods (Borio and Filardo, 2006). Additional complication for the Balassa-Samuelson effect is the problematic empirical distinction between tradable and nontradable sectors. A firm may produce both types of products, or some notionally tradable goods that are not traded as they are directed primarily at the domestic market (Goldstein and Lardy, 2005). Empirical studies available for the NMS suggest that no clear distinction can be made between tradable and nontradable goods, the 'degree of non-tradability' varying between 10 and 85 percent (Čihák and Holub, 2005).

Second, FDI is not homogeneous and its impact on the economy, trade balance and the real exchange rates depends on the capacity of domestic economy to absorb potential benefits and on the recipient sectors. Hence, the impact is both country- as well as time-specific. FDI has grown rapidly in the last two decades, especially in developing countries, where it now accounts for almost half of total inflows (Kose *et al*., 2006). The macroeconomic evidence supports the hypothesis that FDI has a positive effect on economic growth and productivity through the transfer of technology and skills and by augmenting the recipient's domestic capital stock. However, FDI inflows seem to contribute to growth only in countries with a high level of human capital beyond a certain threshold (Borensztein, Degregorio, and Lee, 1998); when countries have well-developed financial markets (Alfaro *et al.*, 2004); or in those with sufficient provision of infrastructure (Kinoshita and Liu, 2007). When such conditions are met, FDI contributes to economic growth by augmenting capital accumulation by "crowding-in" domestic investment (Mody and Murshid, 2005). Moreover, the sectoral composition of FDI matters as positive externalities are realized through interactions between the sector receiving FDI and the rest of the economy. However, the evidence seems to suggest that if FDI is limited to the primary sector, the economy-wide externalities are smaller than if FDI concentrates in the manufacturing sector (Aykut and Sayek, 2007).

Differential effects have been observed for the earlier FDI waves (see, for example, the historic overview in Baldwin and Martin (1999). Specifically, the first wave of FDI in the early 1990s—an example of which is the Volkswagen's bold purchase of the Czech carmaker Škoda—capitalized on the low wage level and a potential for productivity gains in the NMS (Lansbury, Pain and Šmídková, 1996) and was directed primarily into sectors producing tradable goods and services. At that time, in part owing to sharply devalued exchange rates in the transition countries, it would not make much sense to invest into nontradable sectors: the purchasing power of domestic population was low and it distrusted domestically produced goods. In that sense, this FDI wave was a repetition of the wave observed during the pre-WW I period. The second wave occurred in the late 1990s and early 2000s, with the process of real convergence well underway. With per capita incomes rising fast and the prospect of the EU accession looming, the flow of FDI was at least partly re-directed into the sectors producing nontradable goods and services. Especially financial services were a big recipient of these inflows, fueling the credit boom (International Monetary Fund, 2008). Although it would seem useful to be able to distinguish the tradable-sector and nontradable-sector FDI projects, the data and measurement issues seem insurmountable. First, no such aggregate database exists, necessitating using primary sources, classification standards of which differ substantially across countries. Second, all earlier mentioned difficulties with defining tradables and nontradables apply.

Third, one needs to address the measurement of financial integration itself, either using quantitative indicators of the magnitude of capital inflows (Sylwester, 2005, and Hunya, Holzner, and Wörz, 2007) or by qualitative indicators that estimate price convergence (Baltzer, Cappiello, De Santis, and Manganelli 2008). We use the former approach as it captures well the quantitative impact of FDI on the balance of payments, while the empirical effects of price convergence on exports and imports are not so well established. Similarly, the link between FDI and real economy is supported by empirical studies better than the link between total capital inflows and productivity in the recipient country.

IV. AN EMPIRICAL MODEL OF FDI-DRIVEN REAL EXCHANGE RATES

We motivate the empirical estimates with a simple dynamic model of a small, open economy, the real exchange rate developments of which are affected by foreign direct investment.[7] FDI has exercised a powerful effect on transition economies, both by stimulating aggregate supply and by raising permanent income. The two main channels of the impact of FDI on growth are well researched: first, through an increase in total investment and, second, through interaction of the FDI's more advanced technology with the host's human capital (Borensztein *et al.*, 1998, and Lim, 2001).[8] The literature has offered, however, limited agreement on the quantitative importance of those effects, especially in light of measurement issues and various counteracting processes discussed earlier. In the model below we focus on the former effect of capital accumulation, modeling an overall positive effect of FDI inflows on net exports (Holland and Pain, 1998).

The theoretical model

In the model—which resembles that of Blanchard (1981)—FDI is equally productive as domestic capital, contributing to capital accumulation. The impact of FDI can be modeled through standard money- and goods-equilibrium schedules, a classical production function,

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[7] The model does not incorporate any common-currency effect on trade and income (Frankel and Rose, 2002, or Bun and Klaasen, 2002) as the integration of the accession countries with their EU trading partners is assumed to have progressed towards the EU levels. Therefore, a common currency itself is not expected to bring about a significant integration gain.

[8] To the extent the latter channel affects sectoral productivity, it is akin to the Balassa-Samuelson effect.

and uncovered interest parity. Let us denote them as follows, with lower-case variables representing logarithms:

(1) $m - p = \alpha y - \beta R$, ($LM$)

(2) $y = \gamma \dot{k} + \delta c + \psi g + \lambda y^* + \rho f$, ($IS$)

where m is the money supply; p is the price level; y and y^* are domestic and world output, respectively (y^* is external demand unrelated to the real exchange rate); R and R^* are the domestic and world nominal interest rate, respectively; k is the stock of capital, with $\dot{k} \equiv \frac{1}{k}\frac{dk}{dt}$ and t denoting time; c is the real exchange rate; g is the fiscal impulse; and f is foreign direct investment. Greek characters stand for nonnegative and fixed parameters (all smaller than one).

Output is increasing in the stock of foreign direct investment, f, above and beyond the increase in the capital stock, primarily because FDI generates substantial spillovers outside of its sectoral allocation. The IS curve can be thought of as a demand schedule of the usual type (income = consumption + investment + net exports), with g capturing the impact of public consumption and investment on demand and c and y^* capturing the impact of external price and demand developments, respectively. (For simplicity, we assume that the impact of private consumption on demand is zero.) The coefficients δ, λ, and ρ can be thought of as the price, income, and FDI elasticities in a reduced-form, net export equation. As such, equation (2) corresponds to the empirical equations estimated below.

On the supply side physical output is governed by a classical production function:

(3) $y = \varepsilon k$,

where $k \equiv i + f$, that is, the capital stock, k, is composed of “domestic” capital, i, and “foreign” capital, f, both of which have identical productivity at the margin.

Latecomer countries that have suboptimal capital stock accumulate capital faster than advanced countries with an optimal capital stock. Once the capital stock approaches its optimal level, the accumulation process slows down. Total debt is constrained in a debt accumulation schedule, where total debt is accumulated by FDI inflows and fiscal deficits, decrease with domestic growth, and is predetermined by its initial level. Capital accumulation is thus assumed to be decreasing in the existing stock of capital, the real interest rate, and, owing to crowding out, in total debt, d:

(4) $$\begin{cases} k < k^* \Rightarrow \dot{k} = ot - \theta r - \phi k - \eta d \\ k \geq k^* \Rightarrow \dot{k} = \varpi t - \theta r - \phi k - \eta d \end{cases}$$

We have observed that countries with a suboptimal capital stock ($k < k^*$), that is, latecomers, accumulate capital faster than advanced countries with an optimal capital stock ($k \geq k^*$, where k^*/y^* is constant) and, hence, $o > \varpi$. Once the capital stock approaches its optimal level, the accumulation process slows down.

Total debt is constrained in a debt accumulation schedule, where total debt is accumulated by FDI inflows and fiscal deficits, *g*, decrease with domestic growth, and, moreover, each country's debt is predetermined by its initial level, $\bar{d}$:

(5) $d = \bar{d} - \mu y + \kappa f + \iota g$

In other words, we assume that foreign investors care about the transition country's growth prospects, return on FDI, and overall prospects of servicing its obligations (Campos and Kinoshita, 2003 or Bevan and Estrin, 2004). It is reasonable to assume that the other commonly used determinants of FDI inflows (lower wages, market attractiveness, "cultural distance," and so on) are met in the countries in question.

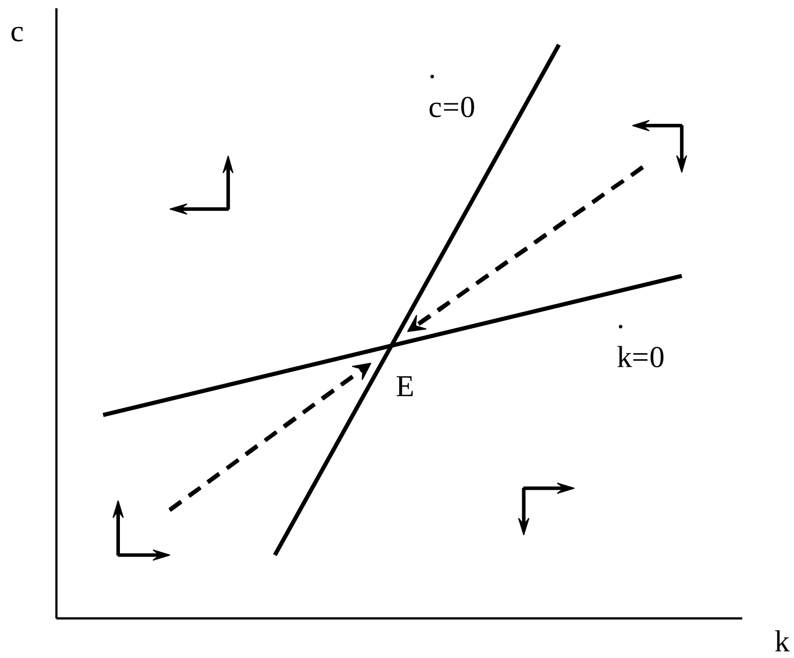
The model is closed with an uncovered interest parity equation:

(6) $\dot{e} = R - R*$, which can be rewritten in real terms as: $\dot{c} = r - r*$.[9]

We assume the following relationships between our parameters. First, the direct contribution of FDI to growth (ρ) ought to be larger than the indirect negative impact thereof through larger total debt and its impact on capital accumulation (ηd). Second, the direct growth impact of a fiscal shock (ψ) is larger than the indirect effect of the capital stock through the production-function-debt nexus ($\gamma\eta\mu\varepsilon$). The solution is a "saddle point" and the equilibrium point is at the intersection of the two stationary lines, $\dot{k}$ and $\dot{c}$, in the capital-exchange rate space, with the only convergent path along the dashed line (Figure 4).

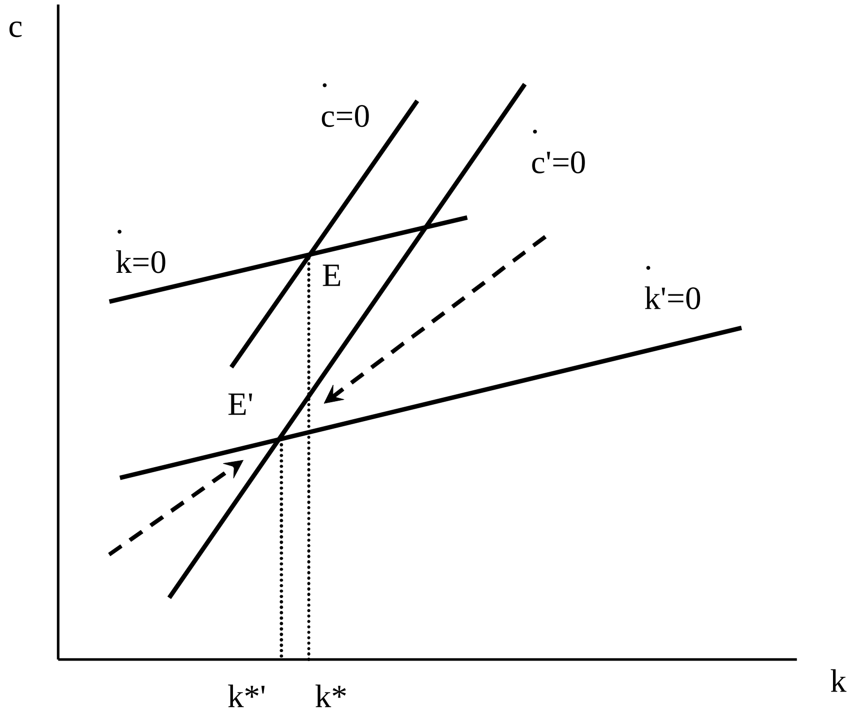
[9] The real exchange rate, *c*, $(c = e + p* - p)$ is influenced by world prices, which can be conveniently thought of as fixed. Hence, over time $\dot{c} = \dot{e} - \dot{p}$ and substituting for $\dot{e}$, the path of the real exchange rate is determined by the interest differential $\dot{c} = r - r*$. In this notation, an increase in *c* implies real depreciation, that is, an increase in competitiveness.

Figure 4. Capital and Real Exchange Rate Equilibrium



We consider a few plausible shocks and their impact on the capital stock and real exchange rate. First, an unexpected permanent increase in foreign direct investment will affect both the real exchange rate and the capital stock, as their stationary lines move south, to $\dot{c}'=0$ and $\dot{k}'=0$ respectively (Figure 5.). As a result, at equilibrium the domestic currency appreciates. The real exchange rate appreciation will be instantaneous, with some overshooting, and the capital stock will decline marginally owing to the FDI shock. Hence, the first-round output and net-export effect is negative, depending on the relative size of the real exchange rate and FDI parameters in the *IS* schedule. The stock of capital will continue increasing, however, and the larger capital stock will boost output, partly offsetting the impact of the first-round real appreciation. These features seem to be consistent with the growth pattern of Central European transition countries.

Figure 5. The Impact of an FDI shock



A number of alternative scenarios can be laid out and explored, such as an increase in total debt ($\bar{d}$) or a permanent increase in foreign demand (*y**). First, an increase in the initial level of total debt will affect only the real exchange rate schedule through a drain on the external current account, gradually appreciating the currency and lowering the equilibrium capital stock through FDI outflow. Second, an unexpected decrease in foreign demand has a symmetric impact on the real exchange rate and capital stock schedules through the LM schedule. As a result, both schedules shift upward by an equal amount, leaving the steady-state capital stock unchanged and the domestic currency depreciated. Whereas falling foreign demand reduced output, the improved competitiveness offsets it by the exact same amount.

The model above offers a sensible if simplified description of the key channels through which positive FDI inflows affect the economy described in the above equations and we draw four main conclusions. First, we note the additional positive growth effects from the FDI inflows. Second, we observe that the FDI-real exchange rate nexus can dominate the net-foreign-asset nexus of exchange rate determination. Third, the associated real appreciation and its negative growth effects may offset some or all of the integration gain. Fourth, the model shows that FDI-dependent economies are vulnerable to changes in their indebtedness.

Since we aim at producing the normative target estimates of sustainable real exchange rates for our three groups of countries—euro area members, inflation targeters and exchange rate fixers—we need a simplified/empirical version of the theoretical model outlined above. On the one hand, the full theoretical model could be calibrated and simulated, and we would compare the trajectories of debt, trade and other variables under flexible and fixed exchange rates. On the other hand, we see benefits of simplifying the framework by treating FDI, trade developments, and growth variables as exogenous vis-à-vis the model. Rather than exploring the different equilibrating mechanisms under the floating and pegged exchange rate regimes, which are well established in the literature, we focus on impact of important variables on the equilibrium exchange rate.

The empirical model

The normative-target, SRER framework has been built around empirically estimated econometric trade equations relating exports and imports to fundamental variables such as the real exchange rate, the terms of trade, external debt, and domestic and foreign economic activity. The SRER model differs from its predecessors in several aspects. First, the FDI driven integration gains are incorporated directly into the model in a manner similar to Šmídková, Barrell, and Holland (2003). Second, the current account balance is not restricted, as it is asset and liability stocks, not flows, that define the external equilibrium. The sustainable level of external debt is defined according to openness to trade. Third, all variables exogenous to the SRER are modeled within an underlying model framework (NiGEM), ensuring consistency and interdependency.

Empirically, we start with trade equations in which trade flows are determined with the same explanatory variables as aggregate demand in the theoretical model. Exports increase with the stock of foreign direct investment (FDI) to approximate the integration gain. Exports also expand with foreign demand and improvement in the relative price of domestic goods either through real depreciation or a terms-of-trade change (the real exchange rate being defined in terms of the relative import price):

$$(7) \qquad X = \alpha_0 . \left(\frac{EP_m}{P} \right)^{\alpha_1} . \left(\frac{P_x}{P_m} \right)^{\alpha_1} . \left(Y^* \right)^{\alpha_2} . F^{\alpha_3} ,$$

where X denotes an export index; E is the US dollar nominal exchange rate vis-à-vis the domestic currency; P_m and P_x stand for the effective price of imports and exports, respectively; P is the domestic consumer price level; Y^* denotes foreign demand; and F measures the FDI-to-GDP ratio. Parameters $\alpha_1 - \alpha_3$ have nonnegative values.

Demand for imports is driven by domestic activity, the real exchange rate, and the FDI stock:

$$(8) \qquad M = \beta_0 . \left(\frac{EP_m}{P} \right)^{\beta_1} . Y^{\beta_2} . F^{\beta_3} ,$$

where M denotes an import index and Y is domestic output. Parameters β_1 and $\beta_2 - \beta_3$ have negative and positive expected values respectively. Moreover, for the integration gain $\alpha_3 > \beta_3$ must hold, that is, FDI improves net exports.

The trade balance, external borrowing, and net external debt interest payments determine the level of net external debt in any given period. External debt, however, is not an unbounded variable. Financial markets form their views on what is sustainable debt trajectory. In the SRER framework the path of sustainable debt is approximated by considering the initial stock of debt and the country specific sustainable debt target for the end of the simulation period.

To the extent that it is not possible to determine the debt target endogenously within the underlying model, we base the targets on selected measures of external sustainability, explained later in the text:

(9) $$D^{*} = \delta\left[D_0, D_T\right],$$

where D^* denotes the sustainable path of net external debt (in the domestic currency, ratio to GDP), and D_0 and D_T are the initial and target levels of net external debt.

A solution for the sustainable real exchange rate reflecting the above economic fundamentals can be found simultaneously using equations (7–9):

(10) $$\left[\overline{M}.\beta_0.(C^{*})^{\beta_1}.Y^{\beta_2}.F^{\beta_3} - \overline{X}.\alpha_0.(C^{*})^{\alpha_1}.\left(\frac{P_x}{P_m}\right)^{\alpha_1}.(Y^{*})^{\alpha_2}.F^{\alpha_3}\right] = (1-r)D^{*}.Y - D^{*}_{-1}.Y_{-1},$$

where C^* is the sustainable real exchange rate; $\overline{M}$ and $\overline{X}$ are the volumes of real imports and exports, respectively, in the base year, respectively; and r is the world real interest rate.

It follows that the more actual net external debt deviates from the target, the more the SRER deviates from the observed real exchange rate.

V. DATA DESCRIPTION, EMPIRICAL ESTIMATES AND PARAMETER CALIBRATION

In this section we describe our data, empirical estimates of trade equations, and selected parameter calibrations. Data consistency is crucial for the SRER calculations, given the endogenous relationship between the various variables, such as domestic and foreign demand or the trade and financial flows. We rely on the global econometric model (NiGEM) maintained by the National Institute of Economic and Social Research, which allows us to project domestic and external variables consistently (for a list see Table 4). Our model simulations are based on an unconditional forecast—we implicitly assume that the NiGEM projection represents the optimal trajectory of macroeconomic developments.

We work with annual data, employing actual values for the period 1998-2007 and NiGEM and IMF projections for 2008-2013 data exogenous to the SRER model. This projection horizon is sufficient to generate medium-term projections of the SRER. The FDI projections are taken from the IMF's World Economic Outlook, where the cutoff year is 2013. That predetermines our projection horizon. The net external debt trajectory—which defines the sustainable external position in the SRER model—is our own normative projection.

Table 4. Definition of Variables

Variable	Notation	Data Source
Effective foreign import demand (in millions of US dollars)	Y^*	NiGEM, September 2008
Effective world real interest rate (in percent)	r	NiGEM, September 2008
Import prices (index)	P_m	NiGEM, September 2008
Export prices (index)	P_x	NiGEM, September 2008
US dollar exchange rate (in domestic currency terms)	E	NiGEM, September 2008
Real domestic output (in constant prices)	Y	NiGEM, September 2008
Real exports (volume)	X	NiGEM, September 2008
Real imports (volume)	M	NiGEM, September 2008
Domestic consumer price index (CPI)	P	NiGEM, September 2008
Initial level of external debt (in millions of US dollars)	D_0	IMF World Economic Outlook, October 2008
Stock of FDI (in percent of GDP)	FDI	IMF World Economic Outlook, October 2008; and IMF IFS, September 2008; 1/
Net external debt target for time T	D^*	Own calculations based on International Monetary Fund (2002)

1/ Calculations based on IMF WEO projections of FDI flows for 2008-2013 and actual values of stock of FDI for 1998-2007.

To calibrate the model we need to obtain estimates of export and import elasticities in equations (7) and (8). We estimate them in logs:

$$(11) \quad \ln(X_t) = A_0 + \alpha_1 \ln(RPX_t) + \alpha_2 \ln(Y_t^*) + \alpha_3 \ln(F_t) + \varphi_t ,$$

$$(12) \quad \ln(M_t) = B_0 + \beta_1 \ln(RPM_t) + \beta_2 \ln(Y_t) + \beta_3 \ln(F_t) + \nu_t ,$$

where $A_0 = \exp(\alpha_0)$, $B_0 = \exp(\beta_0)$, $RPX = \left(\frac{EP_m}{P}\right) . \left(\frac{P_x}{P_m}\right)$ is the relative price of exports, $RPM = \left(\frac{EP_m}{P}\right)$ is the relative price of imports, φ_t and ν_t are white noise disturbances.

Most of the variables in levels appear to be nonstationary, therefore OLS estimates of equations (11) and (12) would be biased. Our sample is too short for robust testing of the order of integration of the series and cointegration relationships. Therefore we specify the estimated equations directly in a dynamic error correction form, allowing for the long-run relationships between the variables in levels and at the same time capturing the short-run dynamics. In addition, we perform system estimates imposing common elasticities across countries, but allowing a separate constant term for each country to capture country-specific differences in the levels of the variables:

$$(13)\qquad \Delta \ln(X_{i,t}) = A_{0,i} - \lambda[\ln(X_{i,t-1}) - \alpha_1 \ln(RPX_{i,t-1}) - \alpha_2 \ln(S_{i,t-1}) - \alpha_3 \ln(F_{i,t-1})] + \alpha_{4,i}\Delta \ln(RPX_{i,t}) + \alpha_{5,i}\Delta \ln(Y^*_{i,t}) + \varepsilon_{i,t},$$

$$(14)\qquad \Delta \ln(M_{i,t}) = B_{0,i} - \delta[\ln(M_{i,t-1}) - \beta_1 \ln(RPM_{i,t-1}) - \beta_2 \ln(Y_{i,t-1}) - \beta_3 \ln(F_{i,t-1})] + \beta_{4,i}\Delta \ln(RPM_{i,t}) + \beta_{5,i}\Delta \ln(Y_{i,t}) + u_{i,t},$$

where λ and δ (expected to be positive) characterize the speed of adjustment towards long-run equilibrium, $\varepsilon_{i,t}$ and $\mu_{i,t}$ are white noise disturbances.

While generally preferring the country-specific estimates, we have to address the tradeoff between country-specific calibrations, based on estimated individual-country trade equations, and a generalized (average) calibration, based either on a full-size or selected-country panels. While the former would guarantee a better short-run fit for most countries, it would make the long-run, cross-country comparisons difficult if not downright doubtful. Specifically, basing the simulations on the estimated country elasticities would mix estimates from countries that are reasonably close to their steady states, with those that are still likely to experience rapid convergence. While the former would comprise the forerunner countries (Greece, Spain, and Portugal), the latter group would comprise Bulgaria and Romania, with the somewhat richer Central European countries falling in between. As the convergence process runs its course, the initially poorer countries approach the economic level of the initially richer countries and trade patterns in the former countries start to resemble the patterns in the latter countries. However, mixing those two types of countries in a single panel would likely lead to misspecified equations.

We thus rely mostly on a generalized calibration tilted toward the more advanced EU countries. Naturally, there are risks associated with our approach. While we gain cross-country comparability, we have to make some ad hoc decisions on the selection of countries to be included in the initial estimation and the subsequent calibration. To ameliorate the potential criticism of data mining, we assess the robustness of our preferred econometric estimates vis-à-vis the full-sample panel with country dummies. In addition, we estimate country-specific elasticities for the FDI variable in order to capture the heterogeneity of the analyzed countries. These country-specific elasticities allow us to distinguish between countries in the pure-blessing, mixed-blessing or curse situations. The economies with nontradable FDI (say, residential construction) may face an "integration pain," while only economies with mostly tradable FDI (say, manufacturing industries) may benefit from a positive integration gain.

In order to calibrate equation (10) for all countries in our baseline scenario simulation (Table 5, left column), we use the point elasticities of the exchange rate, terms of trade, and demand variables obtained from the panel estimates of equations (13) and (14) for the euro-area country group (Greece, Portugal, Spain, and Slovenia). We report the country-specific trade elasticities with respect to FDI in Table 6.

Table 5. Calibrated Coefficients

		New estimates 1/	BBŠ (2008) 2/	Barrel et al. (2002) 3/
Real exchange rate elasticity of exports	α_1	4.03	1.95***	3.15
Terms of trade elasticity of exports	α_1	4.03	1.95***	3.15
Foreign demand elasticity of exports 4/	α_2	1.00	1.00	1.00
FDI (stock) elasticity of exports	α_3	0.56	0.18***	0.70***
Speed of adjustment to long-run equilibrium	λ	0.08	0.04**	0.13***
Real exchange rate elasticity of imports	β_1	-0.79*	-2.10***	-0.62**
Domestic demand elasticity of imports 4/	β_2	1.00	1.00	1.00
FDI (stock) elasticity of imports	β_3	0.20***	0.08**	0.24***
Speed of adjustment to long-run equilibrium	δ	0.55***	0.06***	0.13***

***, ** and * denote significance levels at 1 per cent, 5 per cent and 10 per cent respectively.
1/ Baseline scenario estimates in a panel comprising Greece, Portugal, Spain and Slovenia for the period 1998-2007.
2/ Babecký, Bulíř, Šmídková (2008) estimates in a panel comprising Greece, Portugal, Spain and Slovenia for the period 1995Q1-2007Q3.
3/ Barrel et al. (2002) estimates in a panel comprising Czech Republic, Estonia, Hungary, Poland and Slovenia for the period 1994Q1-1999Q4.
4/ The unitary values of foreign and domestic demand elasticities are imposed.

Regarding the panel parameters (Table 5), the FDI elasticities are in line with earlier research and the integration gain $(\alpha_3 > \beta_3)$ is observable for the whole group. A one-percentage point increase in the stock of FDI increases long-run net exports by almost 0.4 percent (or the difference between α_3 and β_3). Compared to the calibration in Babecký, Bulíř, and Šmídková (2008), these new estimates for a larger and longer sample show somewhat higher export elasticities α_1 and α_3, a lower real exchange rate elasticity of imports β_1, and a higher FDI elasticity of imports β_3. Both calibrations produce broadly comparable estimates of elasticities to the previous studies Šmídková, Barrell, and Holland (2002), Bulíř and Šmídková (2005, 2007) that relied on panel-data results from Barrell *et al.* (2002). Therefore, to assess the robustness of the model simulations, we employ the two most recent of these sets of elasticities for the calibration of the baseline model. The elasticities from Babecký, Bulíř, and Šmídková (2008) are used for the calibration of the benchmark model.

However, the impact of the FDI stock on the import and export volumes differs from country to country (Table 6). First, we observe a group of six countries with a significant integration gain: the Czech Republic, Hungary, Portugal, Slovenia, Spain, and Slovakia. Second, there are four countries with negative and significant FDI elasticities of exports (integration pain): Greece, Latvia, Lithuania, and Romania. For remaining three countries the evidence is mixed since the estimated elasticities are not statistically significant.

Table 6. Country-specific FDI elasticities in export and import equations

	The baseline model: New estimates /1		The benchmark model: BBŠ (2008) /2	
	FDI elasticity of exports , α_3	FDI elasticity of imports, β_3	FDI elasticity of exports , α_3	FDI elasticity of imports, β_3
Bulgaria	-0.14	0.31***	-0.13	0.21**
Czech Republic	1.04***	0.38***	0.58***	0.03
Estonia	0.17	0.16*	0.07	0.05
Greece	-0.89***	0.12	-0.62***	0.00
Hungary	1.22***	0.25***	0.61***	-0.11
Lithuania	-0.60*	0.44***	-0.29***	0.33***
Latvia	-1.69***	0.57***	-1.07	0.85***
Poland	-0.03	0.30***	-0.02	0.35***
Portugal	0.44***	0.00	0.07	-0.22*
Romania	-0.58*	0.88***	-0.19*	0.92**
Slovenia	0.40***	0.23**	0.27***	0.13
Spain	0.24**	0.22**	0.05	0.03
Slovakia	0.52***	0.15***	0.27***	-0.01

***, ** and * denote significance levels at 1 percent, 5 percent and 10 percent, respectively.
1/ The main scenario estimates in the panel comprising Greece, Portugal, Spain and Slovenia for the period 1998-2007.
2/ Estimates from Babecký, Bulíř, and Šmídková (2008) in a panel comprising Greece, Portugal, Spain and Slovenia for the period 1995Q1-2007Q3.

The sectoral impact FDI can be estimated from the long-run changes in the sectoral shares of GDP, assuming that certain sectors are predominantly tradable (say, agriculture or manufacturing), while others are predominantly nontradable (say, construction or services).[10] From Table 7 one can argue that FDI inflows in Greece and Latvia went mostly into nontradable sectors: we observe a relative expansion of the construction sector, while the industrial (manufacturing) sectors shrunk. In the Czech Republic or Estonia FDI seemed to flow into tradable sectors: the manufacturing expanded, while the share of construction either stagnated or declined. Thus, for the former countries FDI seems to be a mixed blessing, while for the latter it seems to be pure blessing.

[10] This finding is akin to the so-called "Rybczynski effect," according to which an increase in a country's endowment of a factor will cause an increase in output of the good which uses that factor intensively (See Rybczynski, 1955). In other words, if a country has specialized in tradable output, FDI is likely to continue to flow into these sectors.

Table 7. Changes in Sectoral Shares of Output, 1995-1997 and 2001-2004 1/

(In percent of total value added)

	Agriculture	Industry (without construction)	*Of which:* Manufacturing	Construction	Services
Cyprus	-0.9	-2.0	-2.1	-0.8	3.2
Czech Republic	-1.3	-1.6	0.2	-1.6	4.5
Estonia	-2.9	-0.9	0.3	0.3	3.0
Greece	-2.6	-1.7	-1.3	1.9	0.9
Hungary	-2.7	-1.4	-0.7	0.6	3.4
Latvia	-2.9	-7.8	-6.3	1.2	9.1
Lithuania	-4.9	-0.3	0.3	-0.8	6.3
Poland	-2.7	-3.8	-3.0	-1.0	7.6
Portugal	-1.7	-2.3	-1.8	1.1	6.3
Slovak Republic	-1.4	-4.1	-3.2	-1.2	6.7
Slovenia	-1.3	-0.1	-0.2	0.0	1.3
Spain	-1.1	-2.6	-1.4	2.5	1.2

Source: AMECO.

1/ To capture the sectoral dynamics, we subtract the average share for 1995-1997 from the average share for 2001-2004. For example, the first cell shows that the relative share of the value added in agriculture in Cyprus declined by 0.9 percentage points between those two periods.

The performance of the calibrated export and import equations and a comparison of the actual and predicted net exports for the main model can be found in Annex III in Babecký, Bulíř, and Šmídková (2009). The dynamics of both imports as well as exports is captured sufficiently well to proceed to the next step of preparing the SRER model.

In the next step, we reflect the various uncertainties related to both calibration as well as exogenous data projections. We use two sets of the estimated elasticities, denoted as the "main" and "benchmark model," respectively, and a total of 11 scenarios for exogenous variables, discussed below. For both models, we assume that the trade relationships are likely to settle at the euro group's levels, but allowing, first, for the country-specific FDI effects on exports and imports and, second, the country-specific constants. In total, we produce 22 SRER trajectories from which we construct the interval estimates of the SRER. The interval estimates are represented with means and with two standard deviation bands.

The first three scenarios relate to sustainable net external debt, which is a crucial normative concept in the SRER model. While the earlier models assumed a universal net external debt target equal to 60 percent of GDP (Ades and Kaune, 1997), the various capital account crises on the past decade have shown that such approach is not flexible enough. Sustainable external debt ought to be related to countries' ability to service it (International Monetary Fund, 2002), and the corresponding uncertainty related to the target can be large. To this end, we follow the IMF's suggestion to derive the steady-state debt levels from the countries' openness to trade: the more open the country, the higher is the sustainable level of external debt (Table 8).

Table 8. Net External Debt Targets

Country	Exports-to-GDP Ratio (in percent)	External Debt Target
Bulgaria, the Czech Republic, Estonia, Latvia, Lithuania, Hungary, Slovakia, Slovenia	Higher than 40	65
Greece, Poland, Portugal, Romania, Spain	Higher than 30, but lower than 40	53

Source: Authors' calculations based on International Monetary Fund (2002).

Our simulations are defined around three alternative paths for sustainable debt that differ in the speed with which the steady-state debt target defined in Table 8 is reached (Table 9). The first scenario assumes that the sustainable net external debt position is close to the current one for the period 1998-2007 and that afterwards it converges slowly to the net debt target value (the steady-state value is not achieved until 2108). The trajectory obviously gives the smallest scope for misalignment during 1998-2007 due to the similarity between the observed and sustainable debt levels. The second scenario starts from initial debt equal to its 1998 observed value and then it converges slowly toward the targeted steady-state value by 2108. The scenario typically produces more visible misalignments for countries whose net external debts were significantly either below or above the debt target by the mid-2000s. The third scenario starts also from the same initial 1998 position, however, net debt converges to the target much faster, achieving the steady-state net external debt level in 2017. Thus we assume that sustainable debt can be much larger than that observed currently in low-debt countries, leading to a much larger sustainable real appreciation. For the individual debt trajectories see Annex IV of Babecký, Bulíř, and Šmídková (2009).

The remaining eight scenarios provide sensitivity analysis for four exogenous variables (positive and negative shocks to foreign demand for exports, domestic demand, the FDI stock, and risk premium attached to interest rates paid on net external debt). More detailed description of all scenarios is provided in Tables 9 and 10. The risk premium scenarios capture the assumption that the adoption of the euro would be accompanied by a decrease in the risk premium (Schadler *et al*., 2005).

Table 9. Summary of 11 Simulation Scenarios

No.	Notation	Scenario description
1	D1	Debt trajectory: Polynomial extrapolation using the actual series for 1998-2007 and the debt target applied to 2108. This is the baseline sustainable debt trajectory.
2	D2	Gradual net external debt convergence toward the target: Logarithmic extrapolation using the actual series for 1998 and the debt target applied to 2108.
3	D3	Fast net external debt convergence toward the target: Logarithmic extrapolation using the actual series for 1998 and the debt target applied to 2017.
4	R_low	A decrease in the risk premium by 2 percentage points during 1998-2013
5	R_high	An increase in the risk premium by 2 percentage points during 1998-2013
6	Y_low	A decrease in real domestic output by one standard deviation
7	Y_high	An increase in real domestic output by one standard deviation
8	Y*_low	A decrease in foreign import demand by one standard deviation
9	Y*_high	An increase in foreign import demand by one standard deviation
10	FDI_low	A decrease in the stock of FDI by one standard deviation
11	FDI_high	An increase in the stock of FDI by one standard deviation

Table 10. The Calibration of the Shocks
(One standard deviation calculated for 2005-2007 as a ratio of the 2007 levels)

	Real domestic output, Y	Foreign import demand, Y*	Stock of FDI, F
Bulgaria	0.06	0.12	0.22
Czech Republic	0.06	0.12	0.06
Estonia	0.08	0.12	0.03
Greece	0.04	0.06	0.15
Hungary	0.03	0.12	0.28
Lithuania	0.07	0.12	0.09
Latvia	0.09	0.12	0.11
Poland	0.06	0.12	0.10
Portugal	0.02	0.06	0.11
Romania	0.06	0.12	0.17
Slovenia	0.06	0.06	0.06
Spain	0.04	0.06	0.09
Slovakia	0.08	0.12	0.16

Source: Authors' calculations.

It is worth noting that the conducted sensitivity analysis works with relatively large shocks (up to 10 percent of the exogenous variable values in 2007) and so the computed SRER intervals should be quite robust. The SRER intervals capture both uncertainty related to the adoption of the euro and implications of the current financial crises through the scenarios of a lower and higher risk premiums and reduced foreign demand for exports, respectively.

VI. SIMULATION RESULTS

We report three types of simulation results (Annex II). First, for the period 1999-2007 we report currency misalignment. Second, we show the SRER projections five years ahead. Third, we report the outcome of one selected scenario simulation—falling foreign demand—that is relevant for the current policy discussion regarding the impact of the financial crisis on the SRER. Throughout the paper we use the EViews 6 (2007) package and the Gauss-Seidel simulation procedure with the solution period of 1998–2013. Exogenous variables are set equal to the observed values for the in-sample computations (1998–2007) and to the forecasted values for the out-of-sample computations (2008–2013).

Misalignment

The misalignment estimate (or a range of them) is based on the simulation results from the above scenarios, pointing toward real exchange rate overvaluation/undervaluation if the interval is above/below the zero horizontal line. In the case of overvaluation/undervaluation the estimated sustainable real exchange rate is weaker/stronger than the observed one, even after considering various uncertainties related to the model calibration, exogenous variable projections, and normative definition of the debt target.

While most currencies seem to be close to the sustainable level, we identify at least one example of sizable misalignment in every sample group. Our simulations for the inflation targeting group identify at end-2007 only one country with a significantly overvalued currency (Romania), two countries with a marginally undervalued currencies (Hungary and Poland),[11] and two countries without visible currency misalignment (the Czech Republic and Slovakia). Among the hard-peggers, we find three countries with an overvalued currency (Bulgaria, Latvia, and Lithuania) and one country without currency misalignment (Estonia). In the control group of the euro area members, there are three countries without significant currency misalignment (Slovenia, Spain, and Portugal) and one country with an overvalued currency (Greece). Consistent with trade deficits in Greece and Portugal, our simulations indicate that both countries went through a prolonged period of overvaluation following the euro adoption.

From these results we conclude that the current misalignment of currencies is neither a problem for the IT group as a whole, with the exception of Romania, nor for the euro area group, with the exception of Greece. The group of hard-peggers, with the exception of Estonia, was the group most likely to encounter problems in the years ahead stemming from the overvalued domestic currency.

[11] In both countries the upper band of the misalignment corridor is touching the zero horizontal line, thus suggesting that the domestic currency was not misaligned under at least some scenarios.

The SRER projections

The SRER projections are computed for five years ahead, again relying on the interval from the 22 simulation scenarios. We find potential stumbling blocks in terms of meeting the nominal convergence criteria for the Czech Republic, Bulgaria, and Romania, however, the remainder of the sample should have less problem with real exchange rate appreciation.

First, the countries with downward-sloping SRER trajectories, that is, sustainable appreciation, can withstand fast real exchange rate appreciation without endangering their growth prospects. While such appreciation is sustainable owing to a favorable set of fundamentals, such as the optimistic projection of FDI inflows, beneficial expected changes in terms of trade, or sustained increase in foreign demand for their exports, these countries may find themselves facing dilemma between the sustainable appreciation benefits and obstacles to the euro adoption as defined in the nominal convergence criteria (the mixed-blessing case). Second, some countries may face only slowly appreciating/stable SRER and would not face any policy dilemma because mild, sustainable real appreciation would be compatible with the required nominal convergence (the pure-blessing case.) Alternatively, some countries may in the future face upward-sloping, depreciating SRER trajectories in the model—because their external environment worsened—and these countries cannot afford the existing real exchange rate appreciation (the pure curse case).

The 2008-2013 SRER projections indicate only four euro candidate countries—the Czech Republic, Bulgaria, Estonia, and Romania—facing the mixed-blessing dilemma, with the sustainable real appreciation estimated at close to 2 percent or more annually (Table 11). The average annual sustainable real appreciation for the remaining countries is estimated at around 1 percent only. This result suggests that the mixed-blessing dilemma will be faced only by some of the NMS, specifically those that either cumulated a large stocks of FDI and have favorable external conditions or those who are in less advanced stages of convergence.

The 2008-2013 projected SRER growth rates are significantly lower as compared to those estimated for the 1999-2007 period. First, we observe a visible deceleration in the sustainable real appreciation for six countries (the Czech Republic, Hungary, Portugal, Slovakia, Slovenia, and Spain). While four of them are either in the euro area already or will join soon, the remaining two have yet to enter the ERM2 regime. We interpret this as the mixed-blessing problem being and medium-term phenomena only, relevance of which will fade away gradually as the convergence process advances further. Second, we identify four countries where sustainable real appreciation is likely to accelerate (Bulgaria, Estonia, Lithuania, and Poland). Finally, for three countries (Greece, Latvia, and Romania) we observe that the SRERs switch from sustainable depreciation to sustainable appreciation. Countries in the last two groups, with the exception of Greece, are comparatively poorer and may face the mixed-blessing dilemma in the future.

Table 11. Sustainable Real Exchange Rate Appreciation (In percent)

	1999-2007	2008-2013
Countries with a decelerating speed of sustainable real appreciation		
Czech Republic (1)	-2.8	-1.7
Hungary (1)	-4.0	-0.8
Portugal (3)	-1.7	-0.8
Slovak Republic (1)	-2.9	-0.7
Slovenia (3)	-0.9	-0.6
Spain (3)	-0.7	-0.6
Countries with an accelerating speed of sustainable real appreciation		
Bulgaria (2)	-0.1	-2.9
Estonia (2)	-1.0	-1.7
Lithuania (2)	-0.3	-1.0
Poland (1)	-0.6	-0.7
Countries switching from SRER depreciation to SRER appreciation		
Romania (1)	1.5	-5.0
Greece (3)	0.1	-1.8
Latvia (2)	2.1	-1.2

Note: Information on monetary policy strategy used by each country is in brackets. The number corresponds to the number of the group: 1 = inflation targeters, 2 = hard-peggers, 3 = euro area members (both forerunners as well as recent entrants).

The crisis scenario

The SRER simulations illustrate that FDI inflows are a necessary but not sufficient cause for sustainable real appreciation and that the other necessary conditions—low level of debt, demand for exports, and so on—must be present as well. The current financial crisis challenges, however, the commonly applied assumption of smoothly increasing foreign demand for domestic exports. A scenario of a sustained medium-term slowdown in the euro area growth, global recession with a corresponding collapse of foreign trade is no longer a tail event and a substantial fall in demand was projected by most of the professional forecasters surveyed by the Consensus Forecasts (2008).

The impact of a large decline in foreign demand, calibrated to be equal to 2 standard deviations of the series, is equivalent to sizable equilibrium depreciation and the SRER trajectories shift upwards and forecast SRER trends become flatter (Annex II.3). Although the SRER sensitivity to foreign demand differs from country to country, the NMS as a group should not count on a sustainable real appreciation trend.

VII. POLICY IMPLICATIONS

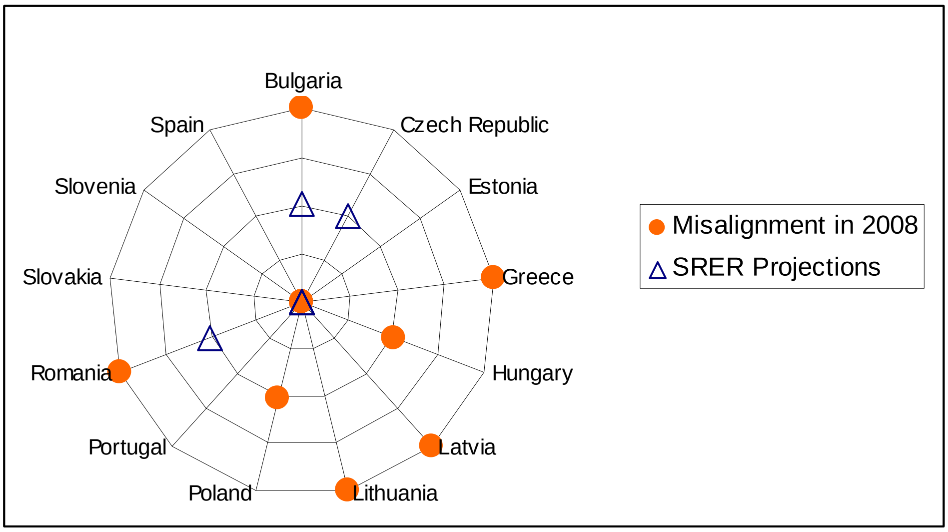
FDI appears to be a mixed blessing for some new member states, making it difficult to simultaneously reap the integration gain of FDI inflows and prepare themselves for the adoption of the euro. On the upside, output and foreign trade are likely to benefit from FDI (the integration gain), especially if FDI-financed projects expand the output of either exportable goods or substitutes for foreign imports. On the downside, this integration gain, foreseen by the financial markets, is reflected in sharp real exchange rate appreciation. While such appreciation is sustainable in the medium-term, owing to the integration gain of FDI, it may complicate the NMS chances to fulfill the Maastricht exchange rate criteria, making FDI a mixed blessing.

In contrast, some NMS received comparatively minor FDI and such limited integration gain can be a pure blessing as the resulting moderate real appreciation may be just compatible with the Maastricht criteria. Of course, mild projected real appreciation may be associated with an overvalued currency should the trade balance worsen and net external debt increase. If anything, these results suggest that the process of euro adoption may be quite complicated and policymakers need to identify the starting position of their economies carefully and plan the process of the euro adoption accordingly. Finally, for those countries that have received FDI mostly into nontradable sectors these inflows can be no blessing at all as they are associated with a deteriorating trade balance, and sustainable growth requires trend real depreciation. Sustained equilibrium real depreciation is incompatible with the Maastricht criteria and may lessen the chances of the euro adoption even more than the sharp appreciation observed in the first group of countries.

The NMS are not a homogenous group as far as the real exchange rates and FDI are concerned. We identify only three non-eurozone NMS for which by 2007 FDI has brought a significant integration gain: the Czech Republic, Hungary, and Slovakia (Figure 6). From these three countries, only the Czech Republic is likely to face the mixed blessing policy dilemma, as comparatively high net external debt offsets the integration gain in Hungary and Slovakia. Consequently, the projected sustainable real appreciation is mild for these two countries. On the other side of the spectrum, we identify three countries (Latvia, Lithuania, and Romania) for which FDI can be a curse since FDI seems to have had a deteriorating impact on their trade balances. Finally, the two remaining Baltic countries have overvalued currencies because they have accumulated sizable net external debt without much integration gain.

Medium-term appreciation of domestic currencies is not the only roadblock to the euro adoption and the NMS have to assess the alignment of their currencies. Overvalued currencies contribute to external imbalances, including external debt accumulation. For example, at end-2007 we observed that a fast euro adoption process was not advisable for Romania and Bulgaria as we projected both fast, medium-term real appreciation of the national currencies and initial overvaluation.

Figure 6. FDI Could be a Mixed Blessing: Summary of the SRER Indicators



Note: The higher the country on the axis, the less favorable its SRER indicators are. Currency overvaluation currencies (circles labeled Misalignment in 2008) and projected sustainable real depreciation (triangles labeled series SRER Projections) increase from the center of the cobweb diagram. If there is no triangle or circle for a country, then our simulation identified neither misalignment, nor sustainable real depreciation .

There are several policy implications of our findings. First, the real exchange rate developments in the NMS need to be assessed carefully in light of the full set of fundamental variables, paying special attention to net external debt and the stock of FDI. Sectoral composition of FDI matters a lot: FDI inflows into nontradable sectors tend to be associated with credit booms and rapidly growing house prices and do not seem to yield the integration gain observed in countries with tradable-sector FDI inflows.

Second, we do not find strong evidence that the choice of the monetary policy strategy may play an important role in the speed of real appreciation, and in the process of attracting FDI, or accumulating the stock of net external debt. The trend real appreciation and the real exchange rate developments observed in the past 10 to 15 years, seem to be determined mostly by real-economy factors, namely the speed of real convergence. However, it seems that inflation targeters and countries outside the euro area were more successful in attracting the FDI than the selected forerunners (Greece, Portugal, and Spain) and hard-peggers, in turn gaining a more favorable position with respect to sustainable real appreciation.

Third, the SRER projections are very sensitive to projections of foreign demand—the positive impact of FDI on trade could be easily neutralized by the current international environment. As a result, policymakers in the NMS could easily face a completely different dilemma. Instead thinking about the mixed blessing of FDI, they could be faced with a need to depreciate real exchange rates in order to sustain the external balance.

Fourth, we have found some support for the standard hypotheses regarding the short, medium and long term impact of FDI. Large foreign capital inflows, irrespective of their nature, tend to appreciate the domestic currency in the short run and/or increase the stock of international reserves. FDI inflows, to the extent they stimulate either tradable output or import substitution, have also an appreciating impact on the sustainable real exchange rate that is our approximation of the external equilibrium. This impact is of medium-term nature, and is likely to diminish as convergence continues. Leaving aside the impact on the equilibrium rate, a volatile nominal rate imposes welfare costs and countries with large and irregular FDI have sterilized at least a part of these inflows.

Fifth, building on the experience of the forerunner countries, it seems that these countries did not attract additional FDI after the adoption of the euro. The NMS should take note of this pattern: FDI inflows are likely to be a medium-term rather than long-term phenomenon. As a result of a diminishing integration gain and a rapidly accumulating stock of net external debt, the forerunners went through a prolonged period of overvaluation after the adoption of the euro. While this period seems to be over for Portugal and Spain, it still continues in Greece, where FDI inflows were associated with credit and house price booms. The forerunners' adjustment process in response to overvalued domestic currencies might be particularly relevant the NMS with hard pegs..

Sixth, the adoption of the euro affects the path of the sustainable real exchange rate. For example, as we have seen in the case in Greece, the post-euro risk premium has been a fraction of that before joining the euro area and the yields on long-term Greek government paper dropped by some 400 basis points, lowering the cost of servicing the existing of stock of debt. To put this result differently, for NMS with high risk premia the eventual cost of misaligned currencies could be trivial compared to the immediate benefits of the eurozone membership (Ozkan, Sibert, and Sutherland, 2004; Bulíř and Hurník, 2006; Schadler and others et al., 2005).

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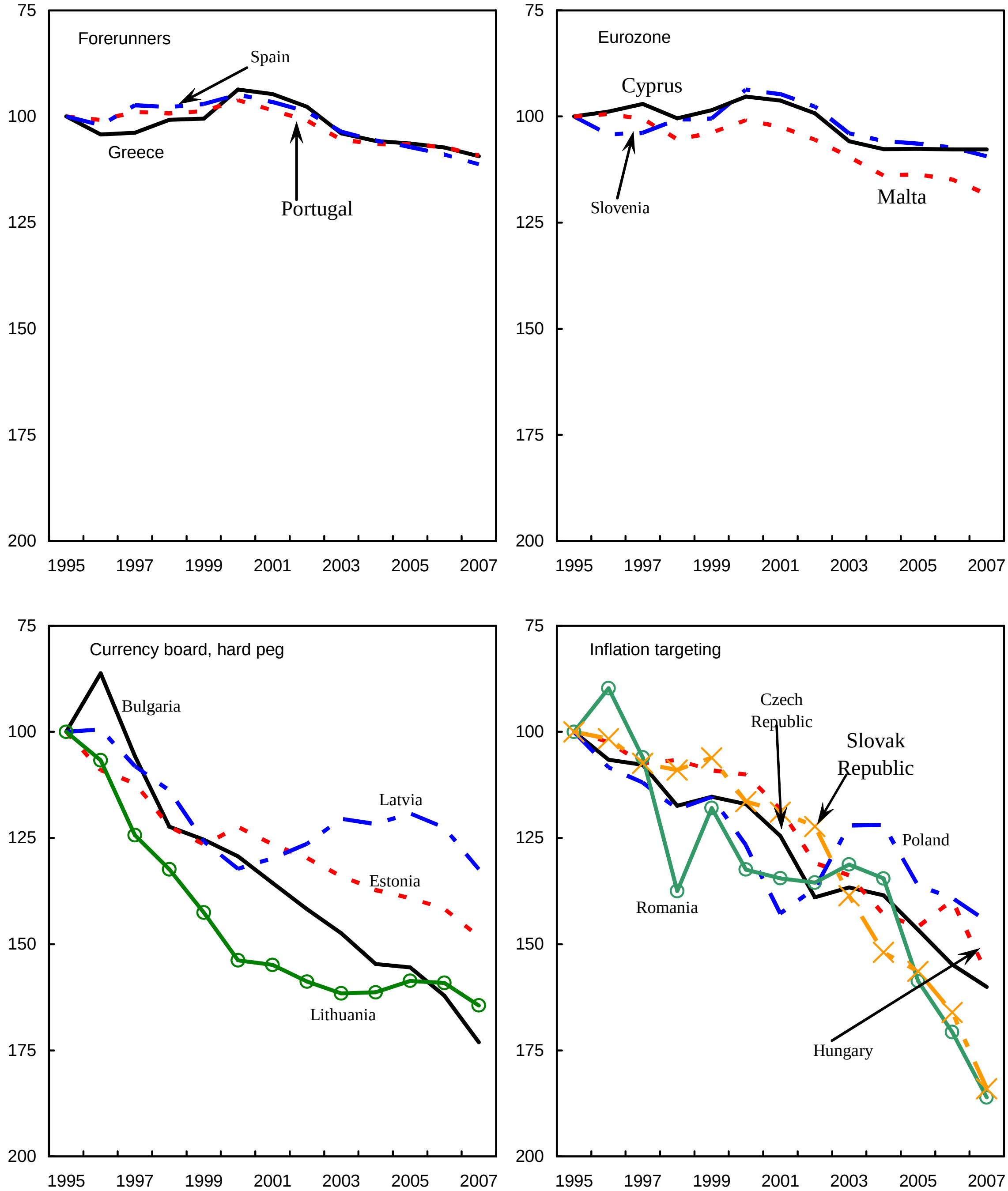
ANNEX I
Stylized facts

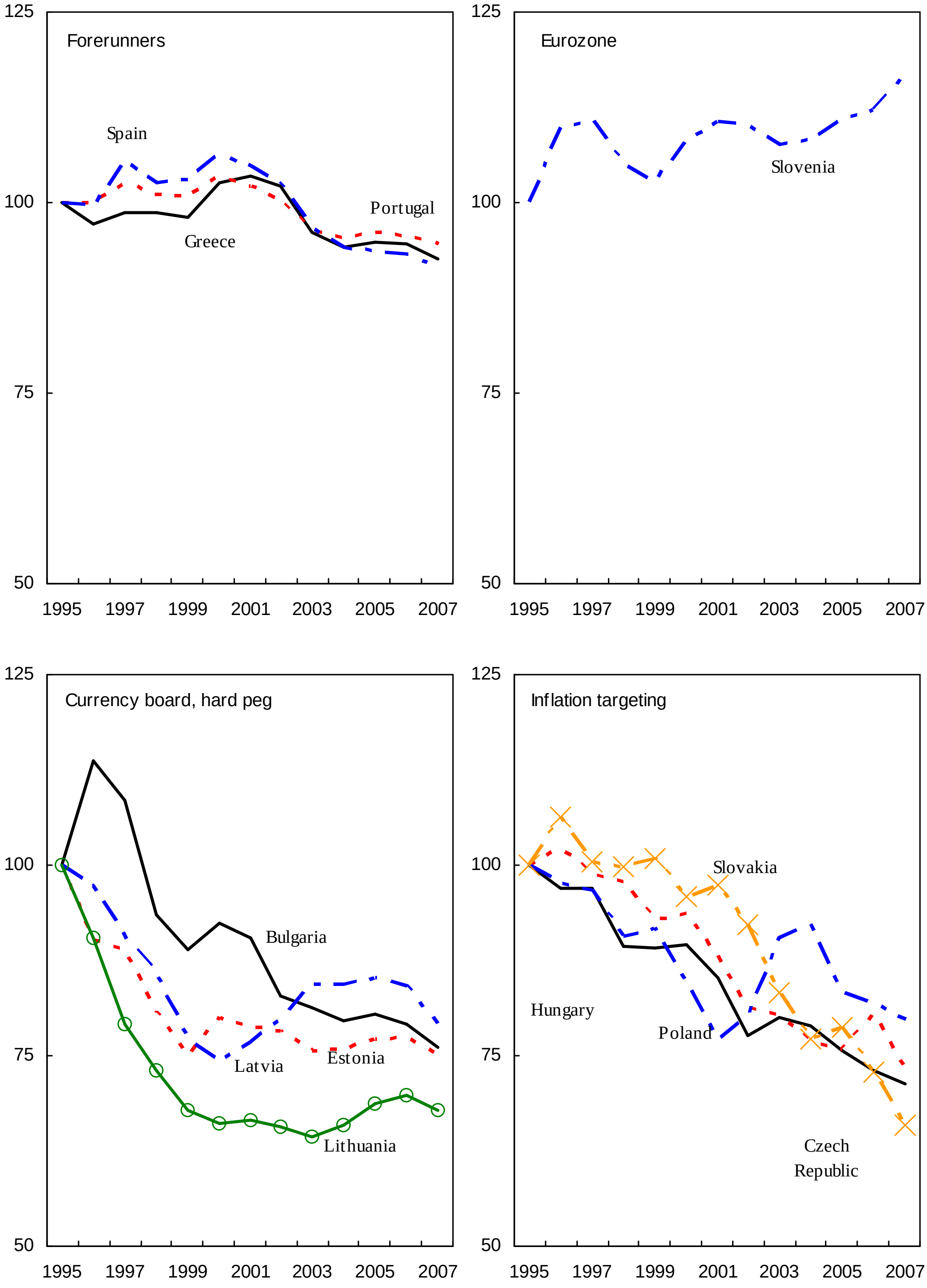
Figure X1. Real Effective Exchange Rates, 1995-2007 1/
(1995 = 100)



Source: *IMF*.

1/ CPI based.

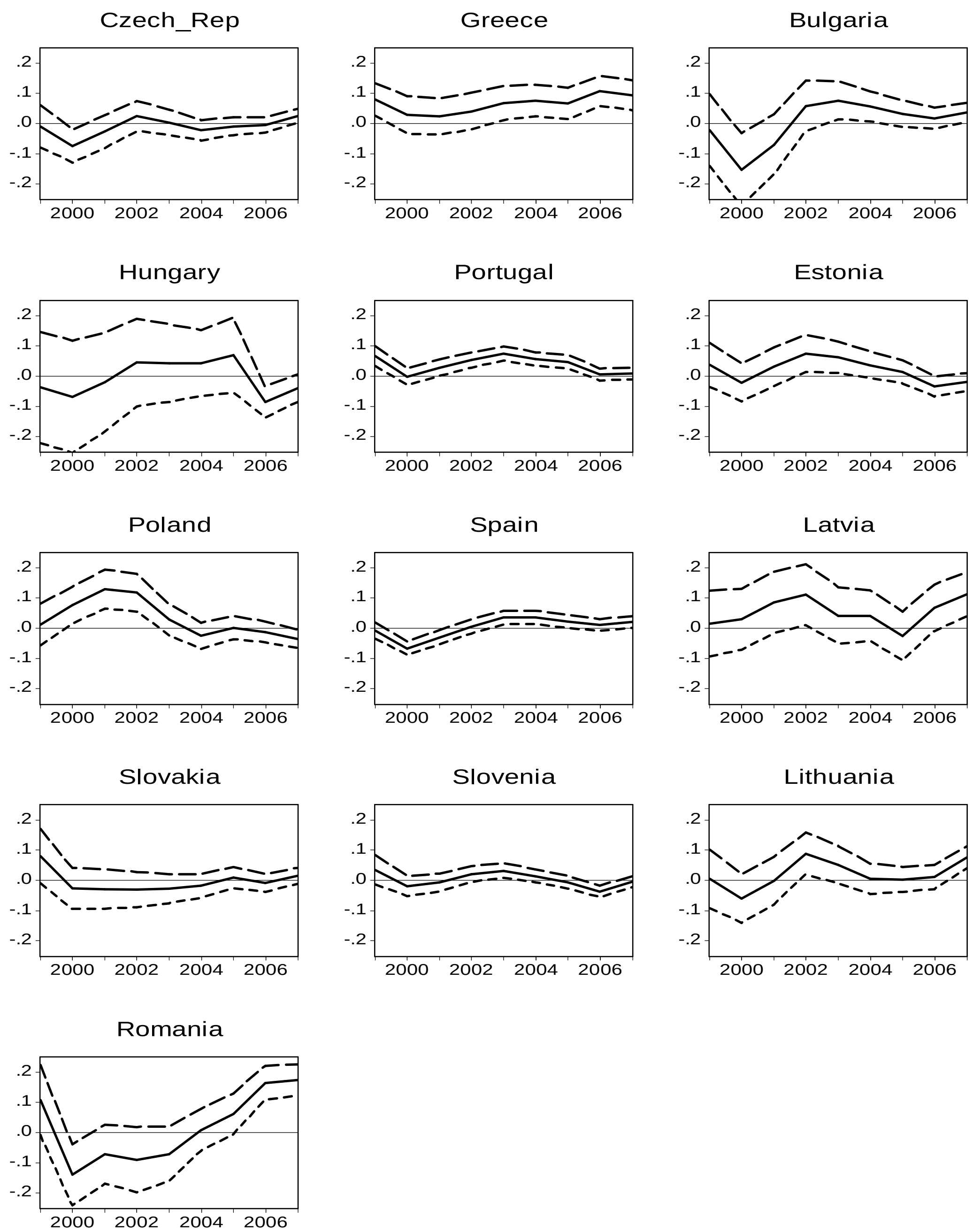
Figure X2. Real Effective Exchange Rates, NIGEM Calculation, 1995-2007
(1995 = 100)



Source: *NIGEM*.

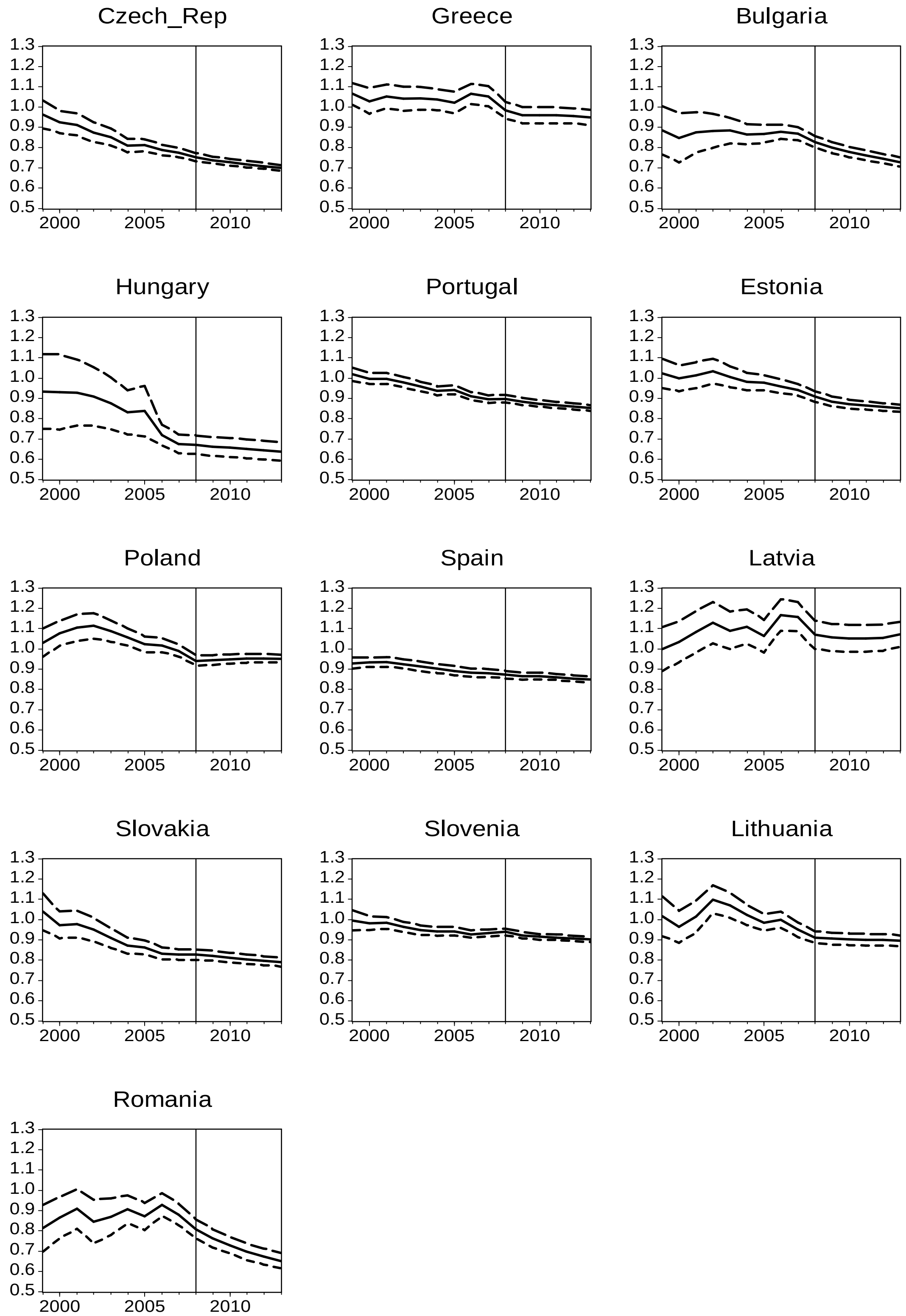
ANNEX II Simulation results

II.1 Real Exchange Rate Misalignment, 1999-2007, Sustainable versus Observed RER (corridors based on 22 scenarios)



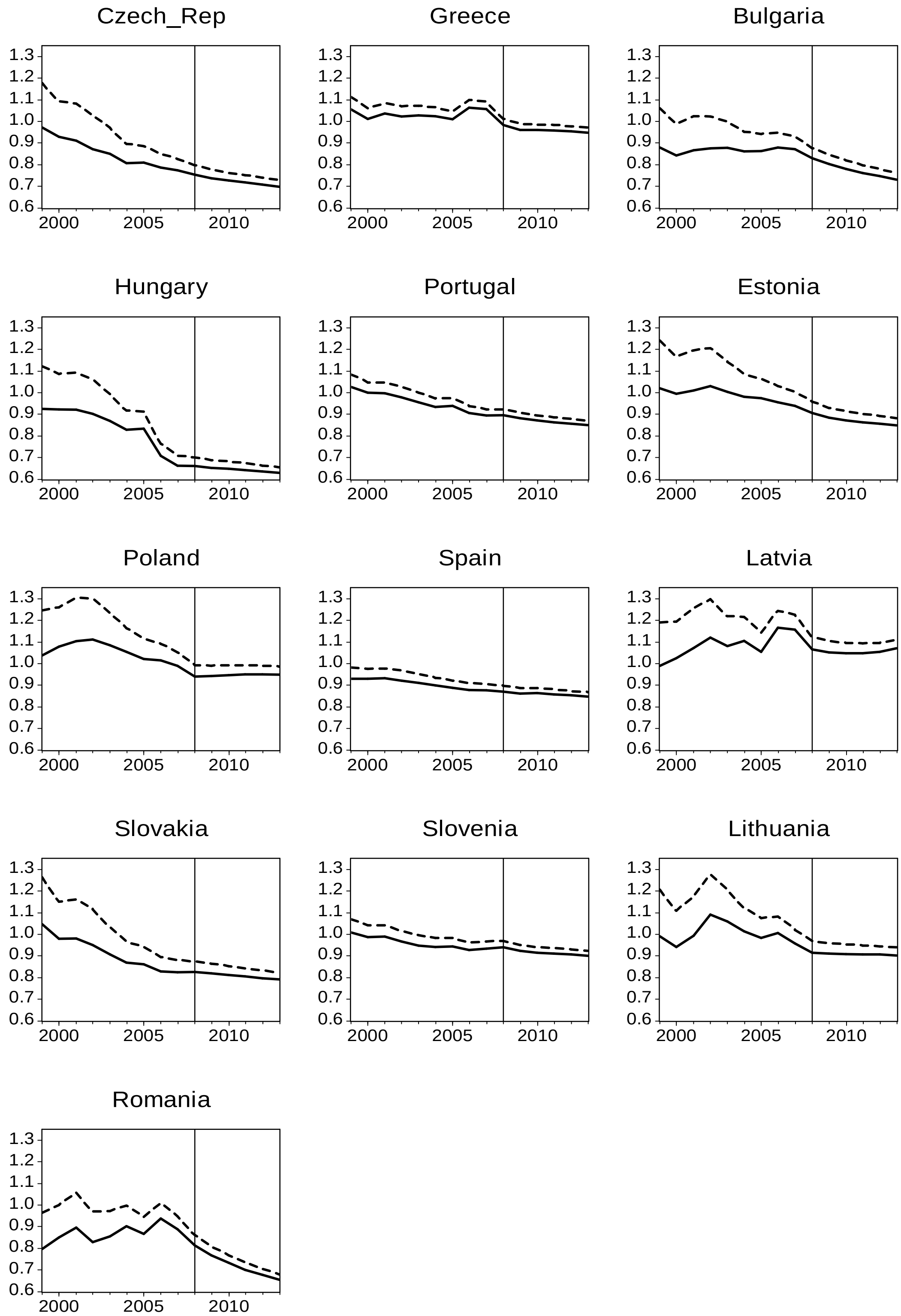
Source: Authors' calculations. Positive/negative values of misalignment indicator imply that the sustainable exchange rate is weaker/stronger than the observed one, and hence that there is a real overvaluation/undervaluation of a domestic currency. Bold line shows mean computed from 22 scenarios, dotted lines show +/-2 standard deviations.

II.2 Sustainable real exchange rates, 1999-2013, simulated and projected values (corridors based on 22 scenarios)



Source: Authors' calculations. Vertical lines denote 2008 when SRER projections start.
Solid line shows mean computed from 22 scenarios, dashed lines show +/-2 standard deviations.

II.3 Decrease in foreign demand, 1999-2013, impact on sustainable real exchange rates, sensitivity analysis (2 standard deviation shock)



Source: Authors' calculations. Vertical lines denote year 2008 when SRER projections start. Solid line shows main scenario. Dashed line shows the impact of a negative foreign demand shock on sustainable real exchange rates.