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Exchange Rate Volatility and Growth in Emerging Europe and East Asia[1]

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1. Introduction

After the 1997/98 Asian crisis a controversial discussion about the pros and cons of exchange rate stabilization has emerged. Proponents of flexible exchange rate have argued that fixed exchange rates encourage speculative capital inflows, moral hazard and overinvestment. The economic policy implication would be to pursue fully (more) flexible exchange rate regimes (Fischer 2001). In contrast proponents of fixed exchange rates have stressed the positive impact of exchange rate stability on the economic performance of the East Asian economies. For instance, McKinnon and Schnabl (2003, 2004a) emphasize the positive impact of low transaction costs for international and intra-regional trade and capital flows.

In the decade after the Asian crisis Emerging Europe and East Asia have taken different directions on the path towards more (less) exchange rate stability. Emerging Europe, i.e. the Central, Eastern and South-Eastern countries have further strengthened their institutional and economic linkages with the European Union. This has led to a wider use of the euro as an invoicing, vehicle, banking, pegging, intervention and reserve currency in the region and more exchange rate stability against the euro (ECB 2006, Kamps 2006). In contrast, in East Asia post-crisis exchange rate volatility against the U.S. dollar steadily declined up to the year 2005, but has increased since then. China and many other East Asian countries seem to follow (hesitantly) international policy recommendations in favour of more exchange rate flexibility.

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What will be the impact of the different exchange rate strategies on economic growth in the two regions? Up to the Asian crisis, an – for emerging market economies – exceptional degree of the international and intraregional exchange rate stability has been regarded as an important pillar of the East Asian miracle (World Bank, 1993, McKinnon 2005). Now Asia seems to move towards (more) exchange rate flexibility (against the U.S. dollar). In contrast, Emerging Europe has experienced high exchange rate volatility during most of the 1990s. Since exchange rates have started to stabilize in the late 1990s growth has accelerated.

Does this imply that ceteris paribus the long-run growth perspective will be better for Emerging Europe than for East Asia? Or do stable exchange rates against the euro encourage speculative capital inflows which in the long-run deteriorate Emerging Europe's growth performance? Previous research on the impact of exchange stability on growth has tended to find weak evidence in favour of a positive impact of exchange rate stability on growth. For the large country sample by Ghosh, Gulde and Wolf (2003) there is weak evidence that exchange rate stability affects growth in a positive or negative way. The panel estimations for more than 180 countries by Edwards and Levy-Yeyati (2003) find evidence that countries with more flexible exchange rates grow faster. Eichengreen and Leblang (2003) reveal a strong negative relationship between exchange rate stability and growth for 12 countries over 120 years. Yet, they conclude that the results of such estimations strongly depend on the time period and the sample.

While many previous studies have chosen very large samples to increase the robustness of the estimation process we approach the question from a different angle. We test the impact of the exchange rate volatility on growth for two groups of countries in the economic catch-up process which have widely dismantled capital controls. This allows us to control for the impact of (often rigid) capital controls which facilitate exchange rate stability but which are detrimental for the growth performance. The comparison of two groups of countries which have pursued different exchange rate strategies at different points of time are expected to yield enough heterogeneity in the cross-country panel to isolate a significant impact of exchange rate volatility on growth.

Building upon De Grauwe and Schnabl (2005) and Schnabl (2006), we perform GLS panel estimations for 17 countries in Emerging Europe and 9 East Asian countries. In addition we use 10 South American countries as a control group. The results provide evidence in favour of a robust negative relationship between exchange rate volatility and growth.

2. Regional Trends in Exchange Rate Volatility

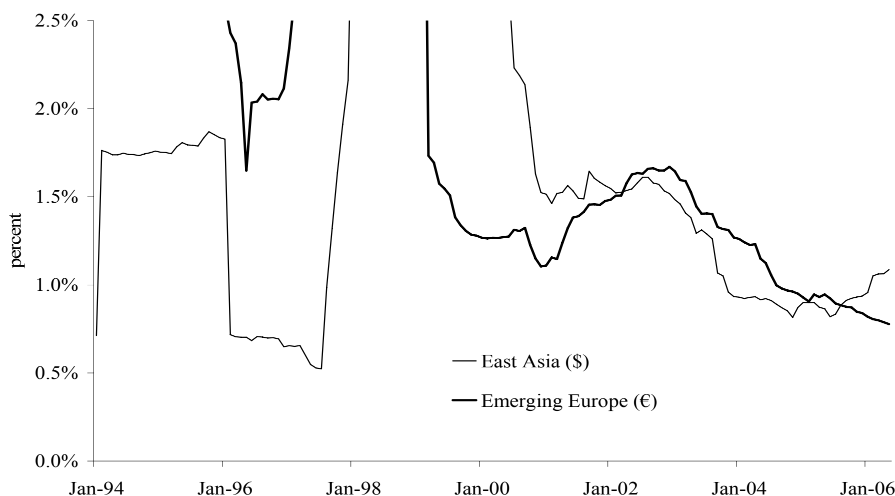
Since the late 1970s the East Asian emerging economies[3] kept their exchange rates tightly pegged to the U.S. dollar (McKinnon and Schnabl, 2004a). This common

[3] Hong Kong, Indonesia, Korea, Malaysia, Philippines, Singapore, Taiwan and Thailand.

dollar peg not only maintained exchange rate stability against the U.S.A. as the most important trading partner, but also ensured an exceptional degree of intra-regional exchange rate stability. McKinnon (2005) argues that this "informal dollar standard" was the basis for a high degree of intra-regional partition of labour and export-oriented growth. Both factors are linked to the East Asia economic miracle (World Bank, 1993). China joined the East Asian dollar standard in 1994 when it pegged its exchange rate tightly to the U.S. dollar.

The intra-regional exchange rate stability in East Asia was high until the 1997/98 Asian crisis interrupted the fast economic catch-up. Post-crisis exchange rate stability against the U.S.A. re-approached the pre-crisis levels up to the year 2004 (McKinnon and Schnabl, 2004b). Since the year 2005 East Asian exchange rate volatility against the U.S. dollar has increased (chart 1). For instance, China and Malaysia have loosened their tight dollar pegs and have allowed for gradual appreciations of their currencies since then (Schnabl, 2006c). Korea has allowed for an unprecedented degree of exchange rate volatility against the U.S. dollar. This may reflect international policy recommendations in favour of more exchange rate flexibility in East Asia.

Chart 1: Exchange Rate Volatility in Emerging Europe (against the Euro) and in East Asia (against the Dollar)



Note: Volatility defined as two year rolling standard deviations of monthly percent changes against the respective anchor currency. Country groups as defined in table 1 are calculated as arithmetic averages. The German mark represents the euro before January 1999.

Source: IMF, International Financial Statistics (IFS).

Thus, while East Asia seems to move from exchange rate stability to (more) exchange rate flexibility, Emerging Europe is moving into the opposite direction. During most of the 1990s exchange rate volatility in the region has been high for two reasons. First, at the beginning of their transition process most of the countries in Central, Eastern and South-Eastern Europe experienced a high degree of macroeconomic instability and depreciations of their currencies. Second, various types of exchange rate pegs (hard pegs, downward crawling pegs, currency baskets) had different anchors. Some countries pegged their currencies to the German Mark (Estonia, Croatia) others to the U.S. dollar (Lithuania, Romania) or currency baskets (Latvia, Hungary, Czech Republic). The outcome was high intra-regional exchange rate instability which can be linked to weak intra-regional trade linkages.

Since the late 1990s exchange rate stability in Emerging Europe has increased steadily. The accession of the Central, Eastern und South-Eastern European countries to the European Union[4] required macroeconomic stabilization which led to a substantial decline in exchange rate volatility. Although some countries such as Poland and the Czech Republic moved to more exchange rate flexibility since the late 1990s intra-regional exchange rate stability increased as many countries re-pegged their currencies from the U.S. dollar to the euro (e.g. Lithuania, Bulgaria, Romania) or substituted currencies baskets by unilateral euro pegs (e.g. Latvia, Hungary).

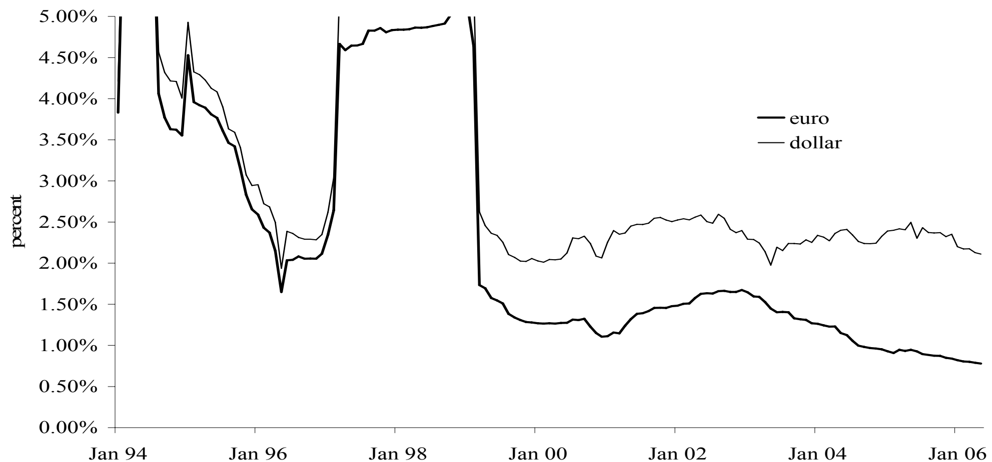
The redirection of the exchange rate targets towards the euro has both institutional and economic reasons. From an institutional perspective all countries (except the UK and Denmark) which join the European Union also have to join – sooner or later – the European Monetary Union (EMU). From an economic perspective the integration into the European goods and capital markets makes exchange rate stability against the euro beneficial as transaction costs decline. For this reason, also non-EU countries such as Albania, Croatia or the FYR Macedonia peg their currencies more or less tightly to the euro. Among the European countries, only Turkey maintains (partially) a dollar peg.

Chart 2 shows the different degrees of exchange rate volatility for Emerging Europe and East Asia both against the euro (before 1999 DM) and the U.S. dollar (unweighted averages). The upper panel depicts exchange rate volatility for Emerging Europe. During most of the 1990s exchange rate volatility was high both against the U.S. dollar and German mark. Since the late 1990s, exchange rate volatility against the euro is significantly lower than against the U.S. dollar and has steadily declined. In East Asia as shown in the lower panel exchange rate volatility against the U.S. dollar has been very low against the dollar compared to exchange

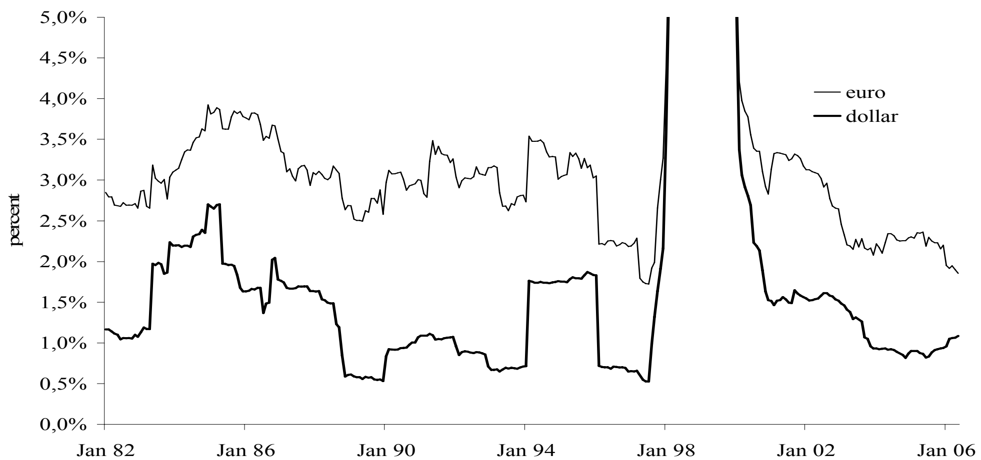
[4] Besides the countries which have already joined the European Union, Turkey, Croatia and the FYR Macedonia are candidate countries; Albania, Bosnia-Herzegovina, Serbia and Montenegro are potential candidate countries.

rate volatility against the euro (German mark before 1999) since the early 1980s except for the 1997/98 crisis period. Since the year 2005 exchange rate volatility has started to rise.

Chart 2: Exchange Rate Variability in Emerging Europe and East Asia



Emerging Europe



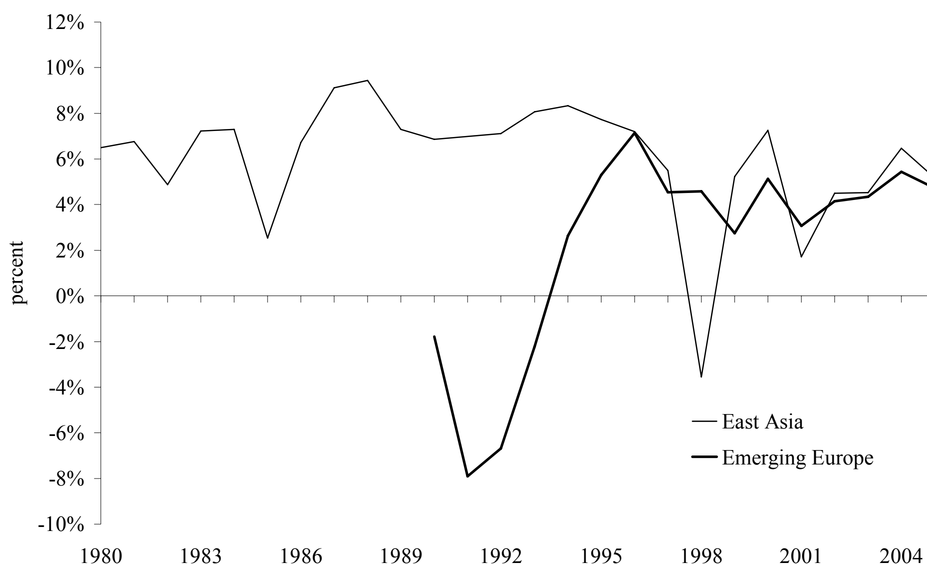
East Asia

Note: Volatility defined as two year rolling standard deviations of monthly percent changes. Country groups calculated as arithmetic averages. The country groups are defined in table 1. The German mark represents the euro before January 1999.

Source: IMF: IFS.

Chart 3 provides an overview over the growth performance of the two regions. Growth is defined as the arithmetic averages of the countries represented in the respective group as listed in table 1. We observe a very high level of growth of the East Asian countries up to the Asian crisis. After the crisis, the average growth in East Asia has pricked up again, but has declined compared to the pre-crisis period. In contrast, in Emerging Europe growth was low at the beginning of the transformation process and jumped to a high level during the second half the late 1990s. This may suggest a negative relationship between exchange rate volatility and growth.

Chart 3: GDP Growth in Emerging Europe and East Asia



Source: IMF. Arithmetic averages.

3. Theoretical Evidence

The increasing degree of exchange rate stability in Emerging Europe and the (still) high degree of exchange rate stability in East Asia pose the question of why countries stabilize exchange rates. The effects of the exchange rate volatility on growth can be seen as a comprehensive measure of the benefits and costs of exchange rate stabilization. The following section surveys the role of asymmetric shocks, international trade and international capital markets as the most important transmission channels from exchange rate volatility to growth.

3.1 Asymmetric Shocks

Flexible exchange rates have been regarded as an important tool to cope with asymmetric (real) shocks (Meade, 1951, Friedman, 1953). The reason is that under fixed exchange rate regimes real exchange rate adjustments have to be carried out through relative price and productivity changes which in a world of price and wage rigidities are slow and costly. The outcome is a lower growth performance.

Mundell's (1961) seminal paper on optimum currency areas (OCA) extended the argument to a monetary union. Interpreting monetary and exchange rate policies as Keynesian instruments of adjustment, Mundell (1961) argued that shock absorption within a heterogeneous group of countries is easier if monetary and exchange rate policies remain independent. In particular for countries with rigid labour markets and low international labour mobility, monetary autonomy was regarded as important. Today, Mundell's (1961) OCA framework remains the most important theoretical tool to analyse the pro and cons of EMU enlargement (see Fidrmuc and Korhonen 2006 for an overview).

In contrast, McKinnon (1963) emphasized the benefits of fixed exchange rate regimes for small open economies in the face of nominal shocks. Assuming that for small open economies the international price level is given and traded goods make up a high share of the domestically consumed goods, exchange rate stability ensures domestic price stability. The welfare effect of stable exchange rates originates in macroeconomic stability which provides a favourable environment for investment, consumption and growth. From this perspective, as acknowledged by Mundell (1973a, 1973b) in later works, monetary and exchange rate policies are regarded as a source of uncertainty and volatility in small open economies. Growth is stimulated when exchange rate fluctuations are smoothed.

3.2 International Trade

The welfare gains from the international partition of labour are widely acknowledged. The economic policy implication is to remove exchange rate volatility to foster trade and higher growth.

The impact of exchange rate volatility on trade among two or a group of countries has both a micro- and macroeconomic dimension. From a microeconomic perspective exchange rate volatility – for instance measured as day-to-day or week-to-week exchange rate fluctuations – is associated with higher transactions costs because uncertainty is high and hedging foreign exchange risk is costly. Indirectly, fixed exchange rates enhance international price transparency as consumers can compare prices in different countries more easily. If exchange rate volatility is eliminated, international arbitrage enhances efficiency, productivity and welfare. For instance, these microeconomic benefits of exchange rate stabilization have been a pivotal motivation of the European (monetary) integration process

(European Commission, 1990) which can be regarded as the most advanced and comprehensive approach to eliminate intra-regional exchange rate fluctuations.

The macroeconomic dimension arises from the fact that long-term exchange rate fluctuations – for instance measured as monthly or yearly changes of the exchange rate level – affect the competitiveness of domestic export and import competing industries. In specific in small open economies the growth performance is strongly influenced by long-term fluctuations of the exchange rate level. Even large, comparatively closed economies such as the euro area and Japan are sensitive to large exchange rate swings, in particular in the case of appreciation. McKinnon and Ohno (1997) show for Japan that since the early 1970s when the yen became flexible against the U.S. dollar growth has been strongly influenced by the appreciation of the Japanese currency.

McKinnon and Schnabl (2003) argue for the small open East Asian economies, that the fluctuations of the Japanese yen against the U.S. dollar strongly affected the growth performance of the East Asian tiger economies. They identify trade with Japan and competition in third markets (US) as crucial transmission channels. Before 1995 the appreciation of the Japanese yen against the U.S. dollar enhanced the competitiveness of the smaller East Asian economies who kept their exchange rates pegged to the U.S. dollar. Economic growth in the region accelerated. Then, the strong deprecation of the yen against the U.S. dollar from 1995 into 1997 slowed down growth in Japans small neighbouring countries, contributing to the 1997/98 Asian crisis.

Although the short-term and long-term exchange rate swings can strongly affect the growth performance of open economies through the trade channel the empirical evidence in favour of a systematic positive (or negative) effect of exchange rate stability on trade (and thereby growth) has remained mixed (IMF, 1984, European Commission, 1990). Bacchetta and van Wincoop (2000) find based on a general equilibrium framework that exchange rate stability is not necessarily associated with more trade. Gravity models have been used as frameworks to quantify the impact of exchange rate stability on trade and growth, in particular in the context of a monetary union. While the size of the coefficient by Frankel and Rose (2002) seems to exaggerate the trade effects of a monetary union, Micco, Stein and Ordoñez (2003) find that in its early years the European Monetary Union has increased trade by up to 16%.

3.3 Capital Markets

Capital markets have been playing an increasing role in the discussion about exchange rate stabilization and growth since the Asian crisis (Eichengreen and Hausmann, 1999, McKinnon and Schnabl, 2004a, De Grauwe and Schnabl, 2005a, Aghion et al. 2006). The impact of exchange rates on economic growth via capital

markets has both a short-term (microeconomic) and a long-term (macroeconomic) dimension.

From a short-term perspective, fixed exchange rates can foster economic growth by a more efficient international allocation of capital when transaction costs for capital flows are removed (McKinnon, 1973). If international capital market segmentations are dismantled debtors in high yield emerging market economies benefit from a substantial decline in interest rates due to investment from low yield developed capital markets (Dornbusch, 2001). The authorities in the emerging market debtor countries have an incentive to encourage capital inflows by dismantling capital controls and by providing an efficient financial supervision.

From a more long-term perspective, fluctuations in the exchange rate level constitute a risk for growth in emerging markets economies as they affect the balance sheets of banks and enterprises of which foreign debt tends to be denominated in foreign currency (Eichengreen and Hausmann, 1999).[5] Sharp depreciations inflate the liabilities in terms of domestic currency thereby increasing the probability of default and crisis. In debtor countries with highly euroized (dollarized) financial sectors, the incentive to avoid sharp exchange rate fluctuations is even stronger (Aghion et. al., 2006, Chmelarova and Schnabl, 2006). Maintaining the exchange rate at a constant level, in particular preventing sharp depreciations, is equivalent to maintaining growth (McKinnon and Schnabl, 2004a).

3.4 Boom-and-Bust Cycles

Although as shown above, fixed exchange rates can support growth in small open economies by encouraging international capital inflows, speculative capital inflows into countries with shallow capital markets can contribute to excess volatility and crisis (Fratzscher and Bussiere, 2004).

During the 1970s and 1980s crisis in emerging market economies was associated with unsound macroeconomic policies, in particular in Latin American countries. The interdependence of volatile macroeconomic policies and crisis is reflected in the first generation of crisis models (e.g. Krugman, 1979). In contrast, the East Asian crisis economies provide an example for boom-and-bust cycles which are driven by "good governance" in macroeconomic policies including fixed exchange rate strategies. Before the 1997/98 crisis the East Asian emerging tiger economies attracted international capital flows (inter alia) for two reasons. First, the East Asian economies pursued favourable macroeconomic polices, i.e. low inflation and low government deficits. Second, the fixed exchange regimes helped

[5] The impact of exchange rate fluctuations in the case of asset dollarization is explored by McKinnon and Schnabl (2004b).

attracting international capital inflows as they provided implicit guarantees to reconvert investments at constant exchange rates against the U.S. dollar.

Both factors interact. To maintain fixed exchange rates in the long-term, a high degree of macroeconomic stability and flexibility is required. In particular labour markets have to adjust to asymmetric shocks. The resulting good macroeconomic performance attracts capital inflows. Interest rates decline. Investment, consumption and growth accelerate. As tax incomes rise due to the buoyant domestic activity, governments can keep deficits (more easily) low. In addition, capital inflows are accelerated if interest rates in the large capital markets are low. In the case of the East Asian emerging economies in the mid 1990s, capital inflows were further encouraged by historically low interest rates in Japan which boosted carry trade and the hunt for yield in Japan's small East Asian neighbouring countries (Schnabl und Starbatty, 1998).

The down side of "virtuous circles" of sound macroeconomic performance and capital inflows as observed in East Asia before the year 1997 is the threat of inflation. While in pre-crisis East Asia, consumer price inflation remained comparatively moderate, inflation rose above the level in the U.S.A. as buoyant capital inflows were translated through foreign exchange intervention into monetary expansion. Given that exchange rates were kept – by and large – constant the East Asian currencies appreciated in real terms. Current account deficits and financial account surpluses rose. The foreign currency denominated external debt and thereby the exposure of the banking sectors increased.[6] Inflation became most visible in the real estate and stock markets where prices rose fast thereby providing evidence of asset price bubbles and overheating.

In East Asia, the currency and financial crisis started with speculation against the dollar pegs which reflected rising concerns about the sustainability of the East Asian boom. The waves of speculation ended with the collapse of the dollar pegs of five East Asian crisis economies which rendered the banking sectors bankrupt. The outcome was severe recessions (chart 3) which were further enhanced by IMF austerity programs. The East Asian crisis was propagated to the other East Asian non-crisis economies which were affected through several transmission channels such as trade, capital flows and FDI. The outcome was most severe for Japan where the Asian crisis caused falling stock prices at the Tokyo stock exchange which finally cumulated in the Japanese financial crisis (Schnabl and Starbatty, 1998).

The lesson drawn from the currency attacks on the East Asian debtor economies was that the pre-1997 system of "soft" dollar pegs itself was at fault (Fischer, 2001). Before 1997, because of high risk premiums – which helped to sustain capital inflows when current account deficits increased – the interest rates in the

[6] Concerning the impact of the currency denomination of external debt and the probability of crises see Eichengreen and Hausmann (1999) and McKinnon and Schnabl (2004a).

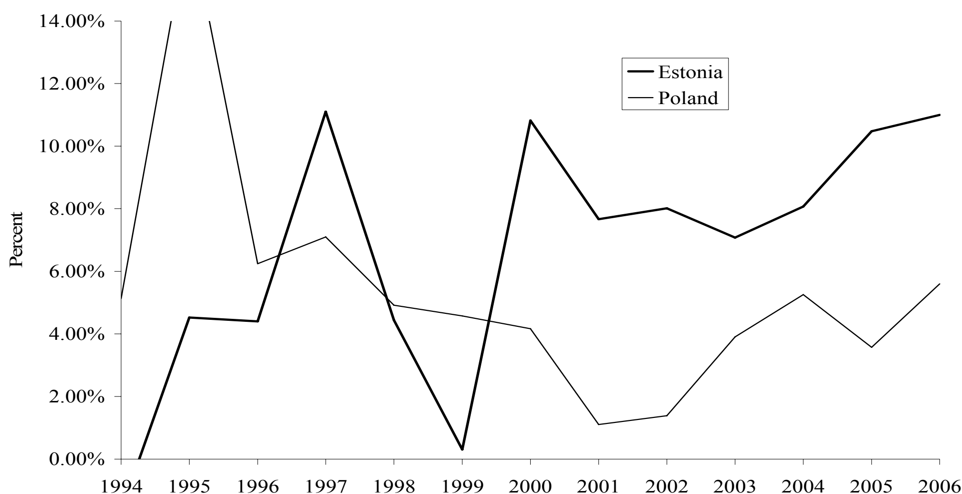
East Asian debtor economies were much higher than on U.S. dollar or yen assets. Domestic banks were tempted to accept low-interest U.S. dollar (or yen) deposits instead of relatively high-interest baht deposits. The temptation to risk foreign exchange exposure was all the greater because exchange rates were (softly) fixed.

The answer of if flexible exchange rates would reduce the risk of crisis is not straightforward and depends on the central bank's response to appreciation pressure. Let's assume a situation of strong capital inflows which are driven by both favourable macroeconomic conditions in the emerging market economy and low interest rates in the large industrialized countries. This would bring the currency of the emerging market economy under appreciation pressure. If the central bank allows for an appreciation and appreciation expectations become sustained additional speculative capital inflows will be encouraged.[7] Under such circumstances the likelihood increases that the central bank will intervene in foreign exchange markets against "excessive appreciation" and the capital inflows will be translated into a rising money supply. Compared to a fixed exchange rate regime the monetary expansion may be even larger because sustained appreciation expectations encourage additional capital inflows. The probability of overheating further rises.

Only if the central bank allows for "uncontrolled appreciation" of the domestic currency, the probability of crisis declines as the appreciation of the domestic currency deteriorates the economic outlook. The negative impact of appreciation on growth will be particularly strong in small open economies because the share of exports of GDP is high and domestic activity is comparatively small. From this perspective the price of a lower probability of crisis will be lower growth. For instance, chart 4 plots the growth rates of Estonia and Poland which can be seen as corner solutions in the choice of the exchange rate regime in Emerging Europe. Estonia has pursued a tight peg to euro (DM) since 1994. Poland has allowed for full exchange rate flexibility since 2001. Both countries have experienced very different levels of growth. Estonia has been growing significantly faster than Poland in average although Estonia was strongly hit by the 1998 Russian crisis.

[7] For countries in the economic catch-up process with inflation targeting frameworks the probability of appreciation is even higher due to the Balassa-Samuelson effect which implies a nominal appreciation if the inflation rate is kept close to the level of the reference economy (De Grauwe and Schnabl, 2005b).

Chart 4: Real Growth in Estonia and Poland



Source: IMF.

The upshot is that the policy choice of fully flexible exchange rates will be difficult to politically defend. This is even more the case when GDP per capita is low and if neighbouring countries with fixed exchange rate regimes experience high growth due to buoyant capital inflows. Discretionary foreign exchange intervention in times of appreciation becomes likely. This may imply that the central bank "jumps" between domestic targets of monetary policy making (for instance inflation targets) in times of a weak currency and exchange rate targets in times of a strong currency. During the economic catch-up – due to the Balassa-Samuelson effect – appreciation pressure is likely to be more frequent (De Grauwe and Schnabl, 2005b). The outcome would be more uncertainty with respect to monetary policy making which can be linked to higher risk premiums on interest rates and thereby lower growth (Schnabl, 2006b).

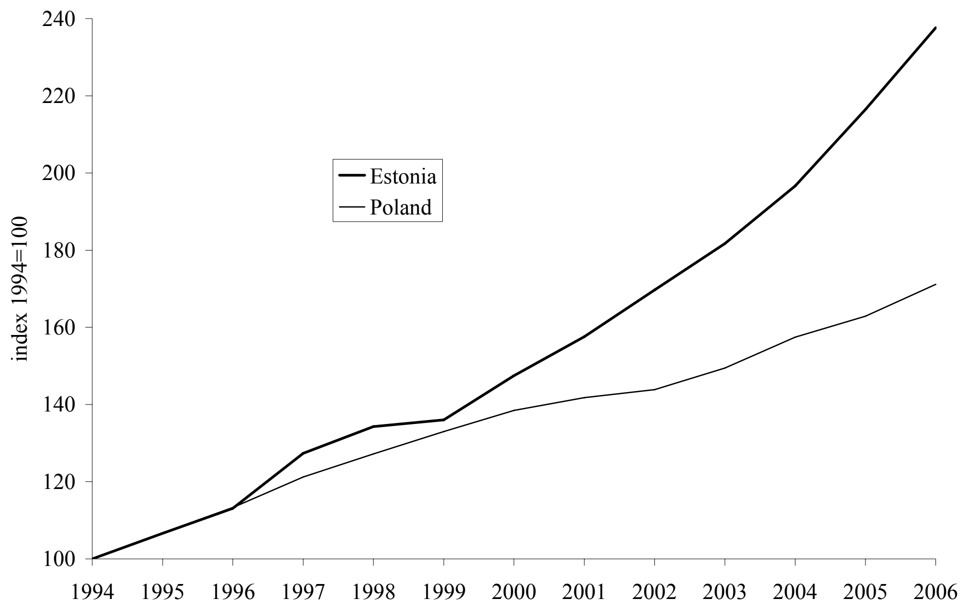
This leads to the long-term cost-benefit-analysis. Countries with fixed exchange rate regimes can better benefit from buoyant international capital inflows and high growth, but risk a higher probability of crisis.[8] Emerging market economies with fully flexible exchange rate regimes won't be able to fully reap the gains of international capital inflows, as appreciation pressure will slow down growth as soon as capital inflows allow for an acceleration of the economic catch-up process.

[8] This hypothesis implies that the respective countries' macroeconomic policies are flexible enough to maintain the peg. If this is not the case, as in Argentina, a flexible exchange rate regime may be the better policy choice.

"Intermediate regimes" which intervene occasionally against the "excessive appreciation" may even face a higher probability of crisis than countries with hard pegs if sustained appreciation expectations encourage additional speculative capital inflows. If capital inflows are curtailed by strict capital controls, domestic interest rates increase and growth will slow down as well.

The upshot is that in the absence of a first best solution, in the long-run credibly fixed exchange rate regimes are the (second) best solution despite a rising probability of overheating. Ranciere, Tornell and Westermann (2003) argue that there is a robust positive relationship between the speed of the economic catch-up and crisis, but that countries which provide favourable conditions for capital inflows – for instance by open capital accounts, macroeconomic stability and exchange rate stability – grow faster in the long-term. From this perspective currently Estonia has a higher probability of crisis than Poland. Yet in the long-run – despite possible crisis – Estonia would catch-up faster than Poland. This may be suggested by chart 5 which depicts the development of real output per capita since 1994 in both countries.

Chart 5: Real Output per Capita in Estonia and Poland



Source: IMF.

4. Empirical Investigation

Given the pro and cons about fixed exchange rates in emerging market economies the question about the impact of the exchange rate volatility on growth remains an empirical matter which is scrutinized here for Emerging Europe and East Asia. This investigation builds upon De Grauwe and Schnabl (2007) for the new EU member states and Schnabl (2006b) for the EMU periphery.

4.1 Sample, Observation Period, and Volatility Measures

To identify the effect of exchange rate volatility on growth, we specify an unbalanced cross-country panel model for 17 Emerging European countries and 9 East Asian countries. In addition we use 10 South American countries as a control group (table 1 provides an overview). First, we include 17 Central, Eastern and South-Eastern European countries which have already joined the European Union or are associated with the EU enlargement process as candidate or potential candidate countries. Serbia and Montenegro are excluded because of insufficient data. Most Central, Eastern and South-Eastern European countries have redirected their exchange rate policies towards the euro.
Second, we include nine East Asian countries, namely China, Hong Kong, Indonesia, Korea, Philippines, Malaysia, Singapore, Taiwan and Thailand. As outlined in section 2 up to very recently the East Asian countries have pegged their currencies commonly to the U.S. dollar (East Asian dollar standard) (McKinnon, 2005). The common dollar peg has been regarded as growth enhancing, but we are not aware of an investigation which provides econometric evidence.

The data sources are IMF International Financial Statistics, IMF World Economic Outlook and the national central banks. We use yearly data, as for some countries data are only available on a yearly basis. The volatility measures are calculated as yearly averages of monthly percent exchange rate changes. The sample period starts for Emerging Europe in 1994, because a substantial part of the sample consists of (former) transition economies. The pre-1994 data are for this reason unstable and very fragmented. The time period is up to the present (2005).

Table 1: Sub-Samples

	Countries	IFS County Code	Panel ID
Emerging Europe	Bulgaria	918	1
	Croatia	960	2
	Romania	968	3
	Turkey	186	4
	Albania	914	5
	Bosnia-Herzegovina	963	6
	FYR Macedonia	962	7
	Cyprus	423	8
	Czech Republic	935	9
	Hungary	944	10
	Latvia	941	11
	Lithuania	946	12
	Estonia	939	13
	Malta	181	14
	Poland	964	15
	Slovak Republic	936	16
	Slovenia	961	17
East Asia	China	924	18
	Hongkong	532	19
	Indonesia	536	20
	Korea	542	21
	Malaysia	548	22
	Philippines	566	23
	Singapore	576	24
	Taiwan	528	25
	Thailand	578	26
Latin America	Argentina	213	27
	Bolivia	218	28
	Brazil	223	29
	Chile	228	30
	Colombia	233	31
	Ecuador	248	32
	Paraguay	288	33
	Peru	293	34
	Uruguay	298	35
	Venezuela	299	36

Note: Serbia and Montenegro were removed due to insufficient data.

To test for the impact of the exchange rate volatility on economic growth, we use de facto volatility measures, because de jure volatility measures have proved to be flawed by "fear *of floating*" (Calvo and Reinhart, 2002, McKinnon and Schnabl, 2004a, De Grauwe and Schnabl, 2005a). Exchange rate volatility can be measured in four ways. First, oscillations around a constant level as measured by the standard deviation of percent exchange rate changes (σ) can be seen as a proxy for uncertainty and transactions costs for international trade and short-term capital flows.

Second, the arithmetic average of percent exchange rate changes (μ) can be seen as a measure for changes in the exchange rate level, i.e. for "beggar-thy-neighbour" depreciations (positive sign) or a sustained appreciation pressure (negative sign) for the respective economy. Both measures are summarized by the z-score ($z_t = \sqrt{\mu_t^2 + \sigma_t^2}$) as proposed by Ghosh, Gulde and Wolf (2003). Fourth, a sustained appreciation or depreciation path can be captured by the yearly relative exchange rate change (γ) comparing January with December. Appreciations exhibit a negative sign, depreciations a positive sign.

All four volatility measures are calculated against the euro and the U.S. dollar. We compute a minimum measure for exchange rate volatility which includes the smaller volatility either against the euro or the U.S. dollar. This matters in specific for the Emerging European countries which have tended to switch their exchange rate targets from the U.S. dollar to the euro. For the East Asian countries and the South American countries the volatility measures are only calculated against the U.S. dollar.

4.2 Model Specification and Estimation Procedure

We use a cross-country panel data model that explains economic growth by exchange rate volatility and a set of control variables[9]:

$$w_{it} = \gamma_i + v'_{it}\,\delta_i + \varepsilon_{it}\ , \qquad (1)$$

where w_{it} is the vector of yearly real growth rates from 1994 to 2005. The explanatory variable v_{it} consists of the indicators of exchange rate volatility (σ, μ, z, γ) and the control variables.

We use standard deviations of monthly exchange rate changes (σ) and January over December percent exchange rate changes (γ) as measures for exchange rate

[9] See Ghosh, Gulde, and Wolf (2003) and Edwards and Levy-Yeyati (2003) for a similar approach.

volatility. Alternatively, the z-score as a comprehensive measure of both is used.[10] As discussed in section 2 there are three main transmission channels from exchange rate stability to growth: interest rates, trade and macroeconomic stability. Exchange rate stability is expected to be linked with lower interest rates, more trade and lower inflation. We use short-term money market interest rates as a proxy for the interest rate channel. Yearly percent changes of exports in terms of U.S. dollar are used as a proxy for the trade channel. Yearly CPI inflation is used as a proxy for macroeconomic stability.

Capital inflows are included as a control variable for the following reason. If capital inflows are low, for instance due to capital controls, this has a positive impact on exchange rate stability, because the need for foreign exchange intervention to maintain the peg is less. Under tight capital controls interest rates increase, as domestic capital markets are disconnected from international capital markets where lower interest rates prevail. Our proxy for capital flows adds net short-term capital inflows, FDI and errors and omission which are regarded as unrecorded capital flows. A positive sign marks inflows, a negative sign marks outflows.

We include dummies for crisis in emerging markets such as for the 1997/98 Asian crisis, the 1998 Russian crisis and several crises in South America (1980–1983, 1994–1995, 1999–2002). We include dummies for inflation targeting regimes which are associated with exchange rate flexibility.

There are a large number of other macroeconomic variables which affect growth and therefore may be considered as control variables such as investment, consumption and government spending. Including these variables into the specification increases the fit of the model, but also decreases the degrees of freedom. In addition, in small open economies most macroeconomic variables are influenced by exchange rate volatility as they are strongly dependent on interest rates, trade and inflation. For this reason, we restrict the control variables to the variables described above.

4.3 Estimation Results

A generalized least square fixed effect model is used as estimation framework.[11] The fixed effect specification models the heterogeneity of the countries in the sample. We choose the General Least Squares model instead of a dynamic specification, as the concern about endogeneity is low. Fast growing countries can not be argued to adopt systematically either fixed or flexible exchange rate regimes. Macroeconomic stability can be argued to affect both the growth

[10] Yearly percent exchange rate changes are correlated with the means of monthly percent exchange rate changes.

[11] Random effect models lead to by and large the same results.

performance and the ability to maintain a fixed exchange rate regime but this source of a possible bias is assumed to be controlled by the inflation variable.

4.3.1 Emerging Europe

The estimation results for Emerging Europe with respect to exchange rate volatility against the euro provide evidence in favor of a negative correlation between exchange rate volatility and growth. The specification for the whole sample with all control variables suggests that exchange rate volatility against the euro has a clearly negative impact on growth (table 2). Both the coefficients for the standard deviations and the z-scores are negative and significant at the 1%-level. In the specification with the highest fit which includes all control variables the yearly change rate of the exchange rate has a positive sign suggesting a negative (positive) impact of appreciation (depreciation) on growth.

The proxies for the transmission channels have the expected signs and are mostly significant at the common levels. Higher interest rates are associated with lower growth at very significant levels. Export growth is positively linked to higher growth, also at very significant levels. Inflation is associated with lower growth, but at lower significance levels. Capital flows have the expected positive sign – inflows (outflows) are linked to higher (lower) growth – but remain insignificant. The dummy for inflation targeting has a negative sign and is significant in some

Table 2: GLS Estimation Results for the Emerging Europe 1994 – 2005 (Euro)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Standard	-0.553***		-0.102		-0.584***		-0.102*	
deviation	(0.160)		(0.064)		(0.160)		(0.063)	
Yearly change	0.009		-0.029***		-0.000		-0.029***	
	(0.009)		(0.008)		(0.009)		(0.007)	
Z-score		-0.426***		-0.242***		-0.537***		-0.252***
		(0.133)		(0.048)		(0.120)		(0.048)
Interest rate	-0.100***	-0.072***			-0.068***	-0.055***		
	(0.026)	(0.021)			(0.021)	(0.017)		
Export growth	0.056***	0.059***			0.055***	0.058***		
	(0.012)	(0.012)			(0.012)	(0.012)		
Inflation	-0.017	-0.025**			-0.014	-0.018*		
	(0.012)	(0.010)			(0.012)	(0.010)		
Inflation target	-0.017**	-0.016*	-0.013***	-0.010	-0.013	-0.013	-0.013	-0.011
	(0.008)	(0.009)	(0.010)	(0.010)	(0.008)	(0.008)	(0.009)	(0.010)
Crisis	-0.000	-0.001	-0.004	-0.003	-0.000	-0.001	-0.004	-0.004
	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)	(0.005)	(0.005)
Capital flows	0.018	0.014	0.008	0.059				
	(0.048)	(0.048)	(0.049)	(0.048)				
Constant	0.057***	0.054***	0.047***	0.043***	0.054***	0.053***	0.047***	0.048***
	(0.007)	(0.006)	(0.005)	(0.005)	(0.004)	(0.004)	(0.003)	(0.003)
Observations	178	178	194	194	184	184	200	481
Number of id	17	17	17	17	17	17	17	41
R^2 within	0.461	0.453	0.199	0.149	0.434	0.434	0.194	0.142
R^2 between	0.287	0.309	0.359	0.341	0.352	0.349	0.323	0.318
R^2 overall	0.315	0.327	0.223	0.174	0.345	0.343	0.216	0.164

*Note: *Significant at the 10% level. **Significant at the 5% level. ***Significant at the 1% level. Source: IMF, national central banks.*

specifications suggesting that countries with inflation targeting frameworks experience lower growth.[193]

Different specifications which exclude one or the other control variable show a stable negative relationship between the z-score and growth. Also the negative sign for the standard deviations is robust. In contrast, without controlling for interest rates, export growth and inflation the coefficient for the yearly exchange rate changes the sign suggesting that appreciation (depreciation) is associated with higher (lower) growth.

An alternative specification estimates the impact of exchange rate volatility on growth for the volatility measure which uses the lowest volatility either against the euro or the U.S. dollar (Min) (table 3). The minimum volatility measure can be regarded as a more precise proxy for exchange rate volatility in the region as some countries in the EMU periphery peg their exchange rates against the U.S. dollar or had pegged their exchange rates against the U.S. dollar in the early part of our sample period. Indeed, the fit of this specification is slightly better than for the previous model. The estimation results are very similar suggesting a robust negative relationship between exchange rate volatility and growth. Inflation targeting frameworks seem to have a negative impact on growth, but remain widely insignificant.

All in all, this suggests that Emerging Europe's move from high exchange rate volatility to increasing exchange rate stability (against the euro) has brought substantial benefits in terms of higher growth. The benefits arise from lower interest rates, more exports and a higher degree of macroeconomic stability. This confirms the role of interest rates, trade and macroeconomic stability as transmission channels. The anchor currency does not seem to matter for the impact of the exchange rate regime on growth as both exchange rate stabilization against the euro and against the U.S. dollar ensure low interest rates (if impediments to international capital flows are removed), exports and macroeconomic stability. Capital inflows seem to have a positive impact on growth.

[12] There are all kind of explanations why this could be the case for the underlying sample but this finding is not valid in general. One explanation is that inflation targeting frameworks are used as tools for disinflation which lead to negative growth effects in the short-term but would lead to higher long-term growth. Lower growth in countries with inflation targeting regimes would be also in line with findings that inflation targeting is associated with lower output volatility because a lower level of growth is linked to less output volatility.

Table 3: GLS Estimation Results for Emerging Europe 1994 – 2005 (Min)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Standard deviation	-0.559***		-0.102		-0.597***		-0.102*	
	(0.160)		(0.064)		(0.160)		(0.062)	
Yearly change	0.009		-0.028***		0.001		-0.028***	
	(0.010)		(0.008)		(0.009)		(0.007)	
Z-score		-0.398***		-0.239***		-0.512***		-0.249***
		(0.132)		(0.049)		(0.119)		(0.047)
Interest rate	-0.101***	-0.076***			-0.069***	-0.057***		
	(0.025)	(0.021)			(0.021)	(0.017)		
Export growth	0.055***	0.057***			0.054***	0.056***		
	(0.012)	(0.012)			(0.012)	(0.012)		
Inflation	-0.016	-0.025**			-0.013	-0.018*		
	(0.012)	(0.010)			(0.012)	(0.010)		
Inflation target	-0.016**	-0.016*	-0.013	-0.010	-0.013	-0.013	-0.013	-0.010
	(0.008)	(0.009)	(0.013)	(0.010)	(0.008)	(0.008)	(0.010)	(0.010)
Crisis	-0.001	-0.002	-0.004	-0.003	-0.001	-0.002	-0.004	-0.005
	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)	(0.005)	(0.005)
Capital flows	0.013	0.011	0.014	0.059				
	(0.048)	(0.048)	(0.049)	(0.049)				
Constant	0.057***	0.053***	0.046***	0.042***	0.053***	0.052***	0.047***	0.047***
	(0.007)	(0.006)	(0.005)	(0.005)	(0.004)	(0.004)	(0.003)	(0.003)
Observations	178	178	194	194	184	184	200	200
Number of id	17	17	17	17	17	17	17	17
R^2 within	0.463	0.448	0.196	0.147	0.436	0.428	0.194	0.139
R^2 between	0.288	0.311	0.372	0.342	0.355	0.359	0.333	0.325
R^2 overall	0.323	0.328	0.222	0.172	0.354	0.346	0.214	0.165

*Source: IMF, national central banks. *Significant at the 10% level. **Significant at the 5% level. ***Significant at the 1% level.*

4.3.2 East Asia

Before the Asian crisis East Asia has been regarded as a role model for the positive impact of (intra-regional) exchange rate stability on (export-led) growth. The observation period for East Asia is considerably longer than for Emerging Europe due to better data availability. The sample starts in 1980 when most countries in the sample had adopted export-oriented industrialization strategies. Exchange rate volatility is calculated against the U.S. dollar. Note that for the East Asian sample the explanatory value is substantially larger than for the Emerging Europe sample.

For the whole sample period the negative impact of exchange rate volatility on growth is strongly confirmed (table 4). The coefficients of exchange rate volatility measured in terms of standard deviations and z-scores are negative and highly significant suggesting a strong negative impact of exchange rate volatility on growth. Also the coefficient measuring appreciation (depreciation) of the East Asian currencies has the expected sign and is highly significant. Appreciation (depreciation) is strongly associated with less (more) growth. This may explain the strong inclination of the East Asian countries to stabilize exchange rates against the U.S. dollar (Dooley, Folkerts-Landau and Garber 2004, McKinnon and Schnabl, 2004a).

The results for the controls variables have mostly the expected signs. As for Emerging Europe, the specification with all control variables has the best fit. Exports have a strongly positive impact on growth. Macroeconomic instability is associated with lower growth. Yet in contrast to Emerging Europe the interest rate has not the expected sign and is insignificant. The dummy for the 1997/98 Asian crisis which controls for the negative impact of the volatility associated with the crisis is clearly negative and highly significant. This reflects the fact that the East Asian crisis was much more severe than the following instabilities in Emerging Europe during the year 1998.

In line with Emerging Europe the dummy for inflation targeting frameworks is mostly negative, associating inflation targeting with lower growth. Yet the coefficients remain widely insignificant. This may be due to two reasons. First, the impact of inflation targeting on growth is weak. Second, the East Asian countries have widely exhibited “fear of floating” even after they have adopted inflation targeting frameworks (Calvo and Reinhart, 2002, McKinnon and Schnabl, 2004b). Capital flows have a positive sign and are very significant reflecting the positive (negative) impact of capital inflows (outflows) on growth.

Table 4: GLS Estimation Results for East Asia 1980 – 2005 (Dollar)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Standard deviation	-0.486***		-0.658***		-0.627***		-0.654***	
	(0.122)		(0.104)		(0.116)		(0.106)	
Yearly change	0.074***		0.074***		0.071***		0.061***	
	(0.017)		(0.019)		(0.017)		(0.020)	
Z-score		-0.156		-0.400***		-0.323***		-0.425***
		(0.104)		(0.089)		(0.098)		(0.087)
Interest rate	0.039	-0.000			0.126*	0.099		
	(0.079)	(0.083)			(0.074)	(0.076)		
Export growth	0.139***	0.137***			0.154***	0.152***		
	(0.017)	(0.018)			(0.016)	(0.172)		
Inflation	-0.093*	-0.133**			-0.091*	-0.124**		
	(0.052)	(0.055)			(0.049)	(0.051)		
Inflation target	0.002	-0.009	-0.000	-0.007	0.003	-0.007	-0.007	-0.013*
	(0.008)	(0.008)	(0.007)	(0.007)	(0.008)	(0.008)	(0.008)	(0.008)
Crisis	-0.032***	-0.029***	-0.036***	-0.031***	-0.027***	-0.025***	-0.036***	-0.033***
	(0.009)	(0.010)	(0.010)	(0.011)	(0.008)	(0.008)	(0.009)	(0.009)
Capital flows	0.135***	0.147***	0.120***	0.122***				
	(0.035)	(0.037)	(0.039)	(0.041)				
Constant	0.049***	0.055***	0.067***	0.069***	0.044***	0.049***	0.070***	0.071***
	(0.006)	(0.007)	(0.003)	(0.003)	(0.006)	(0.006)	(0.003)	(0.003)
Observations	177	177	187	187	210	210	234	234
Number of id	8	8	8	8	9	9	9	9
R^2 within	0.598	0.548	0.390	0.327	0.534	0.487	0.284	0.242
R^2 between	0.420	0.482	0.029	0.085	0.313	0.526	0.069	0.128
R^2 overall	0.540	0.530	0.311	0.278	0.481	0.478	0.250	0.223

*Source: IMF, national central banks. *Significant at the 10% level. **Significant at the 5% level. ***Significant at the 1% level.*

4.4 Sensitivity Analysis

Both the Emerging European and the East Asian sample provide strong evidence that exchange rate volatility is detrimental for growth. The control variables confirm the important role of international trade and macroeconomic stability as transmission channels from exchange rate stability to growth. For the interest rate channel the evidence is mixed, as the Emerging European sample yields the expected result but not the East Asian sample.

We pool the Emerging Europe and East Asian sample to provide a comprehensive picture for the interdependence of exchange rate volatility and growth in emerging market economies. The pooled sample also allows for more heterogeneity within the sample. We restrict the pooled sample to the period from 1994 to 2005 as data are hardly available for Emerging Europe prior to the year 1994. The results are shown in table 5. There is strong evidence that exchange rate volatility affects growth negatively if exchange rate volatility is measured in terms of standard deviations and z-scores.

For the yearly exchange rate changes – as in the case of the Emerging European sample – the coefficient is as expected positive if interest rates, exports and inflation are included as control variables, but are insignificant. If these control variables are excluded the coefficients turn negative and become significant suggesting a positive impact of appreciation on growth. In the pooled sample the inflation targeting dummy remains negative, but is only significant at the common levels in some specifications. Capital inflows have a positive impact on growth at highly significant levels. Note that more information is drawn from the time dimension of the sample than from the cross-country dimension. All in all, the results for the single country groups are confirmed.

To pool the samples of East Asia and Emerging Europe for East Asia the period between 1980 and 1993 had to be dropped. To use the full sample period for the investigation we introduce ten South American countries as a control group (see table 1). This allows us to compare East Asia as a country group with comparatively low exchange rate volatility (against the U.S. dollar) with a country group with comparatively high exchange rate volatility (against the U.S. dollar). The results confirm the positive impact of exchange rate stability on growth while now more information is drawn from the cross-country dimension (table 6).

Table 5: GLS Estimation Results for Emerging Europe (Euro) and East Asia (Dollar) 1994 – 2005

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Standard deviation	-0.473***		-0.265***		-0.513***		-0.261***	
	(0.081)		(0.057)		(0.082)		(0.057)	
Yearly change	0.012		-0.009		0.003		-0.014**	
	(0.009)		(0.007)		(0.008)		(0.007)	
Z-score		-0.405***		-0.289***		-0.475***		-0.312***
		(0.075)		(0.044)		(0.071)		(0.043)
Interest rate	-0.082***	-0.047**			-0.062***	-0.046***		
	(0.024)	(0.019)			(0.020)	(0.018)		
Export growth	0.066***	0.075***			0.065***	0.069***		
	(0.011)	(0.011)			(0.011)	(0.010)		
Inflation	-0.031***	-0.039***			-0.027**	-0.031***		
	(0.011)	(0.010)			(0.010)	(0.009)		
Inflation target	-0.012*	-0.010*	-0.008	-0.008	-0.013**	-0.013**	-0.011	-0.010
	(0.006)	(0.006)	(0.007)	(0.007)	(0.006)	(0.006)	(0.007)	(0.007)
Crisis	-0.003	-0.004	-0.010**	-0.010**	-0.004	-0.005	-0.012***	-0.012***
	(0.004)	(0.004)	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)
Capital flows	0.123***	0.120***	0.122***	0.127***				
	(0.039)	(0.039)	(0.042)	(0.041)				
Constant	0.053***	0.049***	0.049***	0.049***	0.056***	0.055***	0.055***	0.055***
	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)
Observations	266	266	286	286	292	292	308	308
Number of id	24	24	25	25	26	26	26	26
R^2 within	0.478	0.468	0.227	0.226	0.424	0.422	0.193	0.188
R^2 between	0.143	0.151	0.082	0.070	0.309	0.314	0.252	0.234
R^2 overall	0.335	0.342	0.189	0.184	0.354	0.355	0.201	0.194

*Source: IMF, national central banks. *Significant at the 10% level. **Significant at the 5% level. ***Significant at the 1% level.*

Table 6: GLS Estimation Results for East Asia and Latin America 1980 – 2005 (Dollar)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Standard deviation	-0.080***		-0.054***		-0.097***		-0.064***	
	(0.021)		(0.018)		(0.021)		(0.019)	
Yearly change	0.003***		0.000		0.003***		0.000	
	(0.001)		(0.000)		(0.001)		(0.000)	
Z-score		-0.037**		-0.037***		-0.048***		-0.044***
		(0.017)		(0.008)		(0.017)		(0.008)
Interest rate	-0.001***	-0.000*			-0.002***	-0.000**		
	(0.000)	(0.000)			(0.000)	(0.000)		
Export growth	0.101***	0.098***			0.103***	0.099***		
	(0.001)	(0.013)			(0.013)	(0.013)		
Inflation	-0.002**	0.000			-0.002***	0.001		
	(0.001)	(0.001)			(0.001)	(0.001)		
Inflation target	-0.006	-0.004	-0.002	-0.002	-0.011*	-0.009	-0.007	-0.007
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.007)	(0.007)
Crisis	-0.028***	-0.027***	-0.030***	-0.031***	-0.031***	-0.031***	-0.032***	-0.033***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)	(0.005)
Capital flows	0.172***	0.182***	0.174***	0.174***				
	(0.030)	(0.031)	(0.031)	(0.031)				
Constant	0.041***	0.039***	0.049***	0.049***	0.044***	0.043***	0.054***	0.054***
	(0.003)	(0.003)	(0.002)	(0.002)	(0.003)	(0.003)	(0.002)	(0.002)
Observations	385	385	423	423	418	418	470	470
Number of id	18	18	18	18	19	19	19	19
R^2 within	0.363	0.337	0.212	0.214	0.305	0.272	0.141	0.143
R^2 between	0.685	0.650	0.504	0.521	0.708	0.782	0.628	0.624
R^2 overall	0.396	0.366	0.243	0.247	0.357	0.324	0.195	0.199

All coefficients have the expected signs and are mostly highly significant. Exchange rate volatility is strongly associated with lower growth. Appreciations (depreciations) affect growth negatively (positively). All transmission channels have the expected signs and are highly significant. The dummies for inflation targeting and crisis exhibit negative signs. While for crisis the degree of significance is high, the level of significance is low for inflation targeting. Capital flows again turn out as an important driving force of growth in this pooled group of emerging market economies.

All in all, the negative impact of exchange rate volatility for economic growth seems to be robust suggesting that stable exchange rates are the better strategy for emerging market economies with underdeveloped capital markets. The role of international trade, interest rates and macroeconomic stability as transmission channels is confirmed. In addition there is a strong positive impact of capital inflows on economic growth. Note that both East Asia starting from the late 1970s and Emerging Europe starting from the mid 1990s have opened their capital accounts and have allowed for substantial international capital inflows.

In combination with fixed exchange rate regimes capital inflows contribute to lower interest rates and thereby higher investment and consumption. Yet, as outlined in section 3 also the probability of overheating and crisis is increasing. Although in our sample the East Asia has experienced such a crisis, this does not imply that flexible exchange rates are the better policy recommendation. In average the growth performance is higher and thereby the fixed exchange rate regimes should be maintained.

5. Conclusion

We have tested for the impact of exchange rate volatility on economic growth in Emerging Europe and East Asia. While East Asia had traditionally maintained a high degree of exchange rate stability it has moved towards (slightly) more exchange rate volatility (against the U.S. dollar). Emerging Europe (as a group) has continued to pursue increasingly exchange rate stability against the euro although some countries such as Poland and the Czech Republic have allowed their currencies to float substantially and have postponed EMU accession.

We have shown in the paper that there is no straightforward theoretical evidence in favour of or against exchange rate stability in emerging market economies. Neverthless, our empirical investigations suggest that emerging markets with fixed exchange rates grow faster in the long-term. The reason is that fixed exchange rates have a positive impact on international trade, interest rates and macroeconomic stability. As a pre-requisite capital controls have to be dismantled to allow for arbitrage in international goods and capital markets. Open capital accounts in combination with fixed exchange rate regimes also require

macroeconomic stability which can be regarded as a further reason for higher growth.

Despite the strong evidence in favour of a positive impact of exchange rate stability on growth the relationship is not a linear one. Favourable conditions for international investment may encourage speculative capital inflows and overheating as experienced in the case of the Asian crisis. This does not imply, however, that countries should per se adopt flexible exchange rate regimes to reduce the likelihood of crisis because the price would be a considerable lower level of growth.

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