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Studies

Evaluating Inflation Determinants with a Money Supply Rule in Four Central and Eastern European EU Member States

Aaron Mehrotra,
Tomáš Slačik^{1,2}

We evaluate the monetary determinants of inflation in the Czech Republic, Hungary, Poland and Slovakia by using the McCallum rule for money supply. The deviation of actual money growth from the rule is included in the estimation of Phillips curves for the four economies by Bayesian model averaging. We find that money provides information about price developments over a horizon of ten quarters ahead, albeit the estimates are in most cases rather imprecise. Moreover, the effect of excessive monetary growth on inflation is mixed: It is positive for Poland and Slovakia, but negative for the Czech Republic and Hungary. Nevertheless, these results suggest that money does provide information about future inflation and that a McCallum rule could potentially be used in the future as an additional indicator of the monetary policy stance once the precision of the estimation improves with more data available.

JEL classification: C11, C22, E31, E52, O52

Keywords: Determinants of inflation, McCallum rule, Phillips curve, Bayesian model averaging, Central and Eastern Europe

1 Introduction

The analysis of the monetary determinants of inflation is of obvious interest for countries that pursue a policy of inflation targeting. In our study, we focus on four Central and Eastern European (CEE) economies that are currently following an inflation targeting approach or did so in the recent past. These countries are the Czech Republic, Hungary and Poland, which aim to join a monetary union – the euro area – in the future but for the time being maintain monetary independence and conduct policy in an environment of flexible exchange rates, as well as Slovakia, which joined the euro area in January 2009. Slovakia's entry into Monetary Union was preceded by inflation targeting cum ERM II participation and prior to that by a managed float of the exchange rate with implicit inflation targeting.

The novelty of this study is that we employ a monetary indicator based on a prespecified monetary policy reaction function to assess the monetary determinants of inflation. While numerous studies have modeled monetary policy by Taylor-type interest rate feedback rules, less attention has been paid to a McCallum rule that grants a prominent role to the money stock (see e.g. McCallum, 1988 and 2000, and Taylor, 1993). In the rule specified by McCallum, the monetary base serves as the central bank's operating target. For the evaluation of policy both operating targets – short-term interest rates and base money – could potentially be of interest. McCallum (1999) notes that over long periods his rule has agreed with the Taylor rule concerning the correct stance of policy.

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² The major part of this paper was written when Aaron Mehrotra was visiting the Foreign Research Division of the OeNB between January 19 and February 20, 2009. He would like to thank the OeNB, in particular the Foreign Research Division, for their hospitality. The visit was part of the regular exchange and cooperation framework between the OeNB's Foreign Research Division and BOFIT. The paper is set to appear in the forthcoming BOFIT discussion paper series. The authors would like to thank Peter Backé, Markus Eller, Doris Ritzberger-Grünwald, Peter Mooslechner, two anonymous referees as well as commentators from the respective central banks of the four countries covered in the study.

Using the McCallum rule for money supply, we evaluate the monetary determinants of inflation in the Czech Republic, Hungary, Poland and Slovakia. We compute the deviation of actual monetary base growth from that suggested by the rule. Assuming that money matters in the medium and long run, we then include past values of this deviation in the estimation of standard backward-looking Phillips curves for these economies. These Phillips curves are estimated by employing a Bayesian model averaging technique, and the results are compared to estimates on the basis of standard general-to-specific and iterative model selection techniques. In this way, it is possible to evaluate whether money provides information on price level developments in addition to the variables that are typically included in a conventional backward-looking Phillips curve.

Our focus on four CEE economies is justifiable for various reasons. The Czech Republic, Hungary and Poland are all inflation targeters, i.e. price stability plays an important role for the monetary authorities in these economies.³ All three countries aim to join the euro area, which gives a prominent role to money in the second pillar of the ECB's monetary policy strategy (see ECB, 2003). However, money is not – at least explicitly – currently emphasized in the monetary policy strategy of the three countries' central banks. In particular, money is not reported to be part of the forecasting tools of the monetary authorities. For the Czech Republic, monetary indicators are stated not to have significant information content for inflation forecasting over the monetary policy horizon (Czech National Bank, 2006). The fourth economy under study, Slovakia, has already entered the euro area, and its current monetary conditions cannot be analyzed separately from those of the other euro area countries. Nevertheless, the importance of money in the Phillips curve during the periods of implicit and explicit inflation targeting is of interest for those economies currently pursuing such a policy.

The policy rule specified by McCallum or other similar methods to derive an indicator of excess money supply have empirically shown that they provide useful information for policy. Masuch et al. (2003) note that while a Taylor rule indicated an appropriate policy stance with regard to developments in the output gap and inflation during the asset price boom of the late 1980s in Japan, an indicator for excess money growth suggested that monetary growth was very fast at the time. Christiano et al. (2003) argue that a monetary base rule – responding only to money demand shocks – would have made the Great Depression of the 1930s milder. But perhaps the most timely use for such a rule comes during a time when interest rates are very close to or at the zero bound. McCallum (2003) finds that according to his policy rule, the Bank of Japan's policy was too tight most of the time during 1990–1998, when Japan entered a period of deflation. While at the time of writing policy interest rates are still on positive territory in all the CEE economies under study, the financial crisis and the moderation in inflation pressures have led to significant declines in interest rates even in emerging economies.⁴

³ Romania also targets inflation, but it was not included in the analysis due to limited data availability in terms of sample length.

⁴ As at April 2009, Slovakia recorded the lowest policy rate of the four economies, as the ECB had lowered its main refinancing rate to 1.25%; the Czech National Bank lowered its policy rate to 1.75% in February; Poland cut its reference rate to 3.75% in March 2009; Hungary's base rate was 9.5%.

Most prominently, among the advanced economies, the U.S.A. has shifted to a policy of quantitative easing with interest rates effectively at the zero lower bound.

Applying the comprehensive Bayesian model averaging technique, which aggregates available information on the entire model space, we find that the growth of money stock above the McCallum rule-specified values enters Phillips curves robustly for all four countries over a horizon of ten quarters. However, the effect of excessive monetary growth is mixed: It is positive for Poland and Slovakia and negative for the Czech Republic and Hungary. The negative impact likely results from the short sample, which leads to somewhat unstable models and thus a negative sign for money. Nevertheless, regardless of the sign, the robustness of the monetary variable in the Bayesian procedure suggests that it significantly enters the inflation equation and therefore should be taken into account in the evaluation of price pressures. The benchmark results are complemented by the evaluation of the importance of ordinary monetary base growth and trend money growth, in the latter case abstracting from short-run fluctuations. However, the measure of excess money based on the McCallum rule appears to be the most informative indicator for price developments.

This paper is structured as follows: The next section discusses the policy environment in the four economies under study, in particular the role of money and the specified inflation targets. We also mention some of the previous research about the determinants of inflation in these economies. Section 3 specifies and simulates the McCallum rule, and section 4 applies the results of the simulations in the estimation of Phillips curves in the four economies. The final section concludes with policy implications.

2 Policy Environment in the Czech Republic, Hungary, Poland and Slovakia and Previous Literature

All four economies under study are explicitly pursuing or have until recently pursued a policy of inflation targeting. The Czech Republic switched to the current policy regime in December 1997. The central bank set the first target, to be met by December 1998, at 5.5% to 6.5%. At that time, targets were defined in terms of net inflation. The current target is 3%, measured in terms of CPI inflation, and it has been in place since January 2006. An inflation target of 2% was announced to be in effect from January 2010 onwards until the Czech Republic joins the euro area. The Czech National Bank aims to keep inflation within a range of 1 percentage point in either direction of the target.

Hungary adopted an inflation targeting regime in June 2001. At the time, targets were set for December 2001 (7%) and December 2002 (4.5%). In August 2005, an explicit medium-term inflation target was announced for the period starting in 2007, defined as a 3% rate of increase in the consumer price index. A deviation of 1 percentage point is allowed on both sides of the target.

Poland has followed an inflation targeting strategy since 1999. The first inflation target of 8% to 8.5% was to be met by December 1999.⁵ Since the start of

⁵ The target was reviewed in 1999, when the Monetary Policy Council, one of the National Bank of Poland's directing bodies, decided to change the end-year target for CPI from 8.0%–8.5% to 6.6%–7.8%. The inflation target was also reviewed in 2002 (from 5% +/- 1 percentage point to 3% +/- 1 percentage point).

2004, a continuous inflation target of 2.5% has been in place, with a fluctuation band of 1 percentage point on both sides of the target.

Despite the focus on inflation as the current monetary policy target, money is largely absent, e.g. in the forecasting models used by the central banks of the three previously mentioned countries. In the Czech Republic, monetary aggregates do not enter the central bank's forecast directly. They are used as an "auxiliary indicator for verifying the forecast if they contain information on the present or future development of the economy" (Czech National Bank, 2006). The central bank's official publications also suggest that the indicators of the monetary overhang or the money gap do not have significant information content for forecasting inflation over the monetary policy horizon.⁶ These indicators of excess liquidity are nevertheless followed on a regular basis for their information content regarding medium-term inflation developments.

Like in the Czech Republic, money supply does not enter the structural model of the Polish central bank to forecast GDP and inflation. Similarly, for Hungary, money supply is not part of the central bank's forecasting tools, nor does its inflation report discuss the development of monetary aggregates.

The central bank of Slovakia adopted inflation targeting in the beginning of 2005 and – in view of its prospective euro area entry – joined ERM II later that year. Explicit inflation targeting was preceded by a managed float of the exchange rate, coupled with implicit inflation targeting between 2000 and 2005.⁷ A target of 3.5% with a fluctuation band of 0.5 percentage points on both sides was set for December 2005. The inflation target was set below 2.5% for December 2006 and below 2% for December 2007 and 2008. Slovakia became the 16th country to join the euro area on January 1, 2009; the responsibility for monetary policy was thereby transferred to the ECB, which assigns a prominent role to money under the "second pillar" of its monetary policy strategy.

Previous research about the inflation dynamics in the four economies under study include studies by Lendvai (2005), Allard (2007), Menyhért (2008) and Kokoszczynski et al. (2007). Lendvai (2005) estimates traditional backward-looking and hybrid Phillips curves for the Hungarian economy. She finds support for the hybrid specification and its open economy variant that includes imported goods as intermediate production goods. Menyhért (2008) proposes a simultaneous equations method with a maximum likelihood estimator and finds evidence in favor of a hybrid New Keynesian Phillips curve for Hungary. Kokoszczynski et al. (2007) focus on survey-based measures of inflation expectations and estimate New Keynesian Phillips curves using survey data for the Czech Republic and Poland. Allard (2007) estimates an augmented Phillips curve in a panel framework for eight CEE EU Member States in order to assess how trade openness affects the relationship between output and inflation. The study by Melecky and Najdov (2008) emphasizes the link between structural policies and the feasibility

⁶ *The monetary overhang is defined as the deviation of actual money supply from the level corresponding to the current economic cycle or other fundamentals. The money gap is defined as the deviation of money stock from the level reflecting potential economic growth and the inflation target.*

⁷ *Nell (2004) discusses Slovakia's implicit inflation targeting framework, including the use of internal short-term inflation forecasts.*

of macroeconomic stabilization and estimates a hybrid New Keynesian Phillips curve as part of a structural model for Slovakia and FYR Macedonia.

To our knowledge, no evidence of the importance of money for price dynamics, especially in a Phillips curve framework, exists for the four countries under study. However, such evidence has been provided for other economies. Gerlach (2004) proposes a two-pillar Phillips curve for the euro area that incorporates trend money growth – abstracting from short-term fluctuations – and where money growth influences inflation expectations. Neumann and Greiber (2004) similarly provide evidence in a Phillips curve framework that low-frequency growth in money is linked to inflation in the euro area, while Gerlach-Kristen (2007) finds supporting evidence for Switzerland.

3 Simulating the McCallum Rule for the Czech Republic, Hungary, Poland and Slovakia

Following McCallum (2000), the policy rule is defined as:

$$\Delta b_t = \Delta x^* - \Delta v_t^a + 0.5(\Delta x^* - \Delta x_{t-1}) \quad (1)$$

Here, Δb_t denotes monetary base growth, Δx^* is the target growth rate of nominal GDP, Δv_t^a denotes the average change in base money velocity over the previous 16 quarters, and Δx_{t-1} is the nominal GDP growth of the previous period. According to the rule, the central bank must increase monetary base growth when nominal GDP growth falls below its target. The coefficient before the last term ($\Delta x^* - \Delta x_{t-1}$) determines the extent of counter cyclicity of the policy response – it should be high enough so that monetary policy is responsive to misses in the nominal GDP target. However, it should not be so high that the policy rule leads to a destabilizing movement in nominal GDP in the other direction; the value 0.5 is suggested by McCallum (2000).⁸ The average velocity change over four years captures long-term changes in the demand for base money that are due to financial innovations or regulatory changes. Four years is the value suggested by McCallum and is arguably sufficient to avoid cyclical factors influencing base money demand. This measure should also capture changes in the financial system such as remonetization, which may be relevant for transition economies.⁹ The rule has been much less prominent in the literature than Taylor-type interest rate feedback rules due to the obvious fact that central banks in advanced economies use interest rates mainly as operating target, with money adjusting endogenously. In addition to the environment of the zero lower bound and the possible close connection of money with asset prices discussed in the introduction, an additional benefit from a rule such as (1) is that it is fully operational, as mentioned by McCallum (2000). The time-variant terms on the right-hand side of (1) are all known to the policymaker at period t .

An important issue is the determination of the nominal GDP target growth in (1). For Japan, McCallum (2003) assumes a constant value of 5 over 1972–1998,

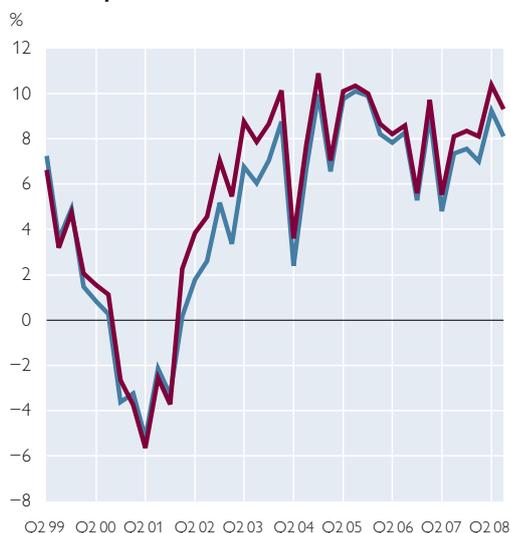
⁸ McCallum has also used other values for this coefficient, notably 0.25 (e.g. McCallum, 1988). The results from our estimations in section 4 are identical for both coefficient values.

⁹ Admittedly, some phenomena that may affect money supply are outside the scope of this modelling approach, such as changes in international investor risk aversion and the corresponding capital flows to or from emerging Europe.

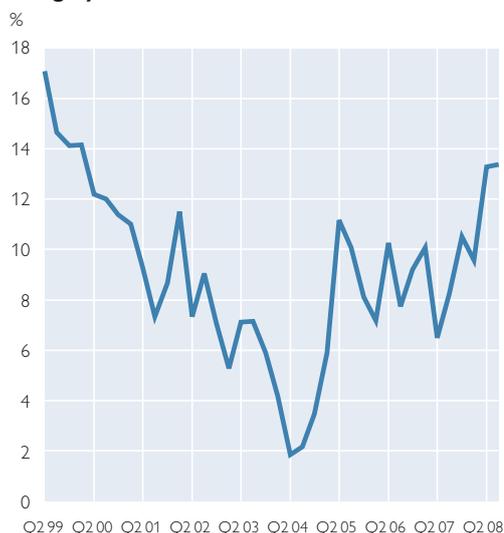
Chart 1

Monetary Base Growth as Suggested by the McCallum Rule

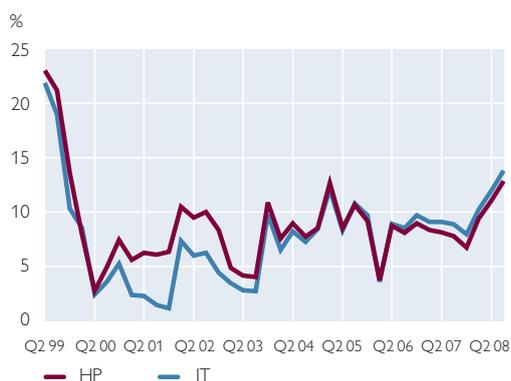
Czech Republic



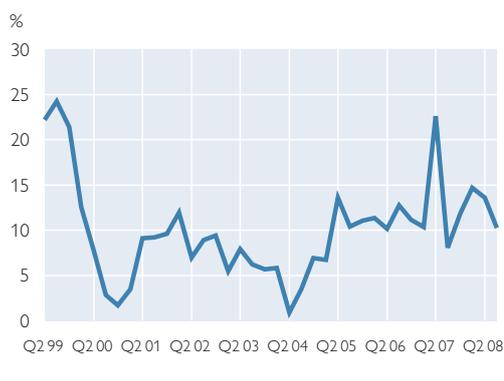
Hungary



Poland



Slovakia



Source: Authors' calculations based on data obtained from national central banks and the European Commission's AMECO database.

Note: For the Czech Republic and Poland we show not only the proposed growth in money supply based on the HP filter but also the alternative measure that relies on an actual announcement of an inflation target (IT) by a central bank. The latter is then added to an estimate of the potential real GDP growth rate of the economy for each year.

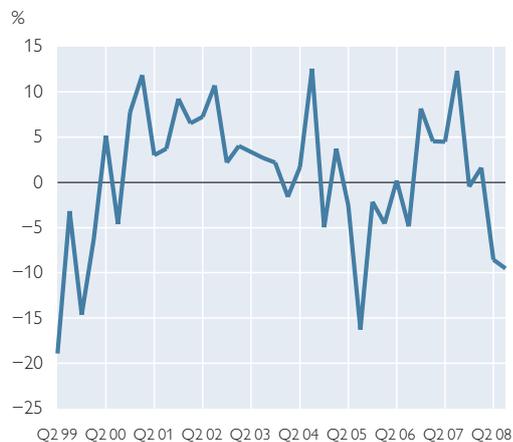
given a long-term potential real GDP growth rate of 3%, combined with an inflation target of 2%.¹⁰ We follow two different approaches. Under the first approach, we apply a filtering technique, extracting the trend from actual nominal GDP series in levels with a Hodrick-Prescott (HP) filter and calculate the growth rate from the resulting smooth trend series.¹¹ The alternative approach relies on an

¹⁰ In McCallum and Hargraves (1994), the authors specify real GDP targets as the long-run averages of realized values for G-7 countries. Moreover, 2% is taken as a common inflation target. As these data span several decades for advanced economies, we do not consider this a relevant approach for our study, as the relevant economies underwent structural change and a disinflation process.

¹¹ In order to mitigate the end-of-sample problem with the HP filter, we calculate 1-quarter-ahead forecasts for the first differences in nominal GDP with an AR(1) model for Q4 2008–Q4 2009, at each step re-estimating the model. The HP filter is then applied to the resulting extended nominal GDP series in levels, with the conventional smoothing parameter of 1,600.

Deviation of Actual Base Money Growth from the McCallum Rule

Czech Republic



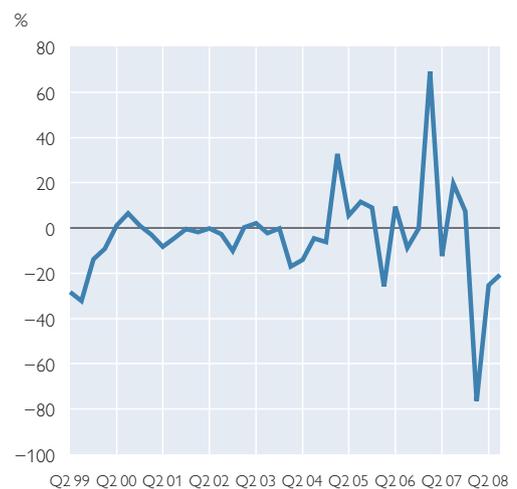
Hungary



Poland



Slovakia



Source: Authors' calculations based on data obtained from national central banks and the European Commission's AMECO database.

Note: The McCallum rule is calculated by means of the nominal GDP target obtained by a Hodrick-Prescott filter.

actual announcement of an inflation target by a central bank, which is then added to an estimate of the potential real GDP growth rate of the economy for each year, obtained from the European Commission's AMECO database. For Hungary and Slovakia, the latter method is not possible as inflation targets have been specified only from 2001 and 2005 onwards, respectively. Due to the need to include four years of data in the specification of the velocity variable, the McCallum rules are simulated for the period Q2 1999 to Q3 2008 for all four economies (raw data for quarterly GDP are typically available from 1995 onwards).¹²

¹² Data for GDP are from the CEIC database (Hungary, Poland, nominal GDP for the Czech Republic). Real GDP series for Poland 1995–1996 and the Czech Republic are from the Eurostat Newcronos database. For Slovakia, both real and nominal GDP are from Eurostat. Base money data come from the CEIC database, combined with data from the websites of the Hungarian and Polish central banks and the BIS for Slovakia. Consumer price data are from the Vienna Institute for International Economic Studies (wiiw) database. The data for nominal effective exchange rates are from the BIS (Eurostat database for Slovakia).

Chart 1 displays the proposed growth in money supply by the McCallum rule employing the two different approaches to calculate the nominal GDP target. Here, as in other parts of the paper, we use year-on-year growth rates since the quarter-on-quarter changes in the monetary base are very volatile in the countries under study.¹³ For the Czech Republic and Poland, where both measures of the nominal GDP target are available, these provide strikingly similar McCallum rule-based prescriptions for monetary base growth.¹⁴

The measure of deviation of actual money growth from the policy rule, for which we used the nominal GDP target obtained by a HP filter, is displayed in chart 2. Due to the volatility in actual base money growth, the measure of deviation is quite volatile for all economies.¹⁵ However, over time, the average deviation is effectively zero in three countries in our sample. It amounts to only 1.02 percentage points in Hungary and is even smaller in the Czech Republic and Poland (0.67 and -0.09 percentage points, respectively). In Slovakia, the deviation is somewhat higher at -4.02 percentage points.

4 Estimation of Phillips Curves with a Monetary Indicator

4.1 Econometric Model and Estimation Technique

After having computed our monetary indicator, we now evaluate its information properties as regards inflation developments. We base our model specification on the standard Phillips curve similar to the one used by Gerlach-Kristen (2007) in her analysis of a two-pillar Phillips curve for Switzerland. While some studies mentioned in section 2 have analyzed inflation dynamics by means of hybrid Phillips curves for the economies under study, the inclusion of money does bring a forward-looking element to the model. Money growth may affect both current and future inflation by increasing inflation expectations. We augment the Phillips curve by including the deviation of actual money growth from the value specified by the McCallum rule. This results in the estimation of the following equation:

$$\pi_t = \alpha + \sum_{i=1}^p \beta_{1,i} \pi_{t-i} + \sum_{j=1}^{\gamma} \beta_{2,j} y_{t-j} + \sum_{k=1}^{\varepsilon} \beta_{3,k} \Delta e_{t-k} + \sum_{l=1}^{\mu} \beta_{4,l} m_{t-l} + d_H + u_t \quad (2)$$

Apart from the monetary indicator m_t , inflation π_t in (2) depends on its past values, past values of the output gap y_t and cost-push shocks, Δe_t , represented by changes in the nominal effective exchange rate. In the case of Hungary, we include a dummy variable d_H that takes the value of 1 in all four quarters of 2001 and 0 otherwise. It captures the level shift in base money resulting from a decrease in the compulsory reserve deposit ratio by 4 percentage points on February 1, 2001.

¹³ The volatility associated with quarter-on-quarter changes in prices also led to the choice of year-on-year changes in consumer prices as the measure of inflation in the estimation of Phillips curves. The Bayesian model averaging method produces more significant coefficients in this case. The calculation of the four-year average change in base money velocity is based on quarter-on-quarter changes in velocity in order to preserve sufficient observations in our short samples.

¹⁴ As the two measures provide very similar nominal GDP targets and estimation results for the Czech Republic and Poland, we did not consider additional methods of constructing the nominal GDP target, for example different filtering methods.

¹⁵ For Hungary, the monetary base growth rate is affected by a change in the compulsory reserve deposit ratio, as explained in section 4 of the paper.

Due to the limited length of the sample (Q2 1999 to Q3 2008), the lag structure of (2) is restricted a priori to include lags 1 and 3 of inflation, output gap and the nominal effective exchange rate (hence, $p = \gamma = \varepsilon \in \{1, 3\}$) as these variables are expected to impact inflation particularly in the short run (see Slačák, 2008). In contrast, for the monetary indicator the 4th, 6th and 10th lags are included ($\mu \in \{4, 6, 10\}$) on the grounds that excessive monetary growth has been shown in the literature to matter for inflation rather in the medium to long run, as in the second pillar of the ECB's monetary policy strategy (ECB, 2003).¹⁶

Since our model is technically an autoregressive distributed lag model (ARDL) of the general form

$$\pi_t = \mu + \sum_{i=1}^p \gamma_i \pi_{t-i} + \sum_{j=1}^r \beta_j x_{t-j} + u_t \quad (3)$$

the long-term effect of the variable x can be computed simply by

$$\frac{\sum_{j=1}^r \beta_j}{1 - \sum_{i=1}^p \gamma_i}, \quad (4)$$

see Greene (2003). The estimations are carried out by using ordinary least squares (OLS).¹⁷ However, due to possible autocorrelation in the error terms we employ the Newey-West heteroscedasticity and autocorrelation consistent (HAC) covariance estimator. In order to determine the relevant inflation determinants, including their lags, three alternative techniques are employed. The first one is a general-to-specific strategy based on hypothesis testing. The starting point is the most general model including all variables and lags from the prespecified set. We then proceed iteratively, at each step eliminating the least significant regressor, i.e. variable-lag combination, based on the p -value. We continue with this procedure until we are left with a parsimonious model containing only those regressors that are significant at the 10% level. The second strategy involves an iterative selection from all possible models (a total of 2^k models, where k stands for the number of initial regressors).¹⁸ Here, the model corresponding to the lowest value for the Schwarz information criterion (SIC) is chosen.

Although the two previous techniques are rather standard, they entail some pitfalls. Under the general-to-specific strategy, the model space is strongly limited, as model reduction starts from the biggest model, whose size is then iteratively reduced. It does not take into account possible model alternatives with variables that have already been excluded. Implicitly, this procedure thus imposes a rather

¹⁶ Admittedly, there is some arbitrariness in the choice of lags, but due to the limited sample size not all lags can be included in the general model and the lags chosen should capture the short-, medium- and long-term impact.

¹⁷ If money and prices were cointegrated, an error correction model would be a possible alternative to the approach employed in the paper. However, our measure of excess liquidity is clearly stationary according to a standard ADF test for all four economies (see also chart 2), which rules out cointegration in its usual sense for the two variables. If ordinary money growth is used instead, an ADF test rejects a unit root for this series as well, at least at the 10% level for all countries. The results for inflation are not clear-cut; for some economies a unit root cannot be rejected, depending on the exact specification of the test.

¹⁸ As the prespecified set includes 9 regressors (3 variables with 2 lags each and 1 variable with 3 lags), there are in total $2^9=512$ possible models.

strong restriction, as it presumes to know a limited model space in which the true model has to be included. Given the lack of an unambiguous theoretical framework that would uniquely determine the variables and lags to be chosen, neither the true model nor the restricted subset of all possible models from which the true model must be selected are known. The strategy based on the SIC in principle takes into account this model uncertainty. Nevertheless, it often fails to converge to an unambiguous model owing to sensitivity with respect to the definition of variables and the initial specification (see e.g. Slačik, 2008, and the references therein). Yang (2007), who compares hypothesis testing and model selection strategies both theoretically and empirically, argues in favor of model combining for estimation and prediction. He suggests that the large variability of the estimator from model selection can be significantly reduced with a proper weighting.

One way to combine models with a proper weighting is the Bayesian model averaging (BMA) technique, which we employ as our third approach. The BMA algorithm proposes averaging the parameter values over all (relevant) alternative models using posterior model probabilities as respective weights.¹⁹ Hence, the BMA algorithm aggregates dispersed information from the entire model space and is thus the most comprehensive of our three methods. As such major attention should be paid to it while the other, often inconsistent, selection criteria should be taken with a grain of salt. The key measure capturing the relative importance of the different inflation determinants under BMA is the so-called inclusion probability. For each covariate, it is computed as the sum of the posterior probabilities of those visited models that include the respective variable. It can be interpreted as the probability that a given variable belongs to the true specification. Since we assign equal priors to all models, our prior on the inclusion probability of each variable is 0.5.²⁰

4.2 Estimation Results

Tables 1 to 4 in the appendix display the results for each of the four countries under study. The monetary measure is the deviation of monetary base growth from the McCallum rule (based on year-on-year growth rates), with the nominal GDP target computed by applying the Hodrick-Prescott filter. This measure is available for all four economies. The three columns in the tables show the estimated parameter values and standard errors for the models based on the BMA, the p -value, and the SIC procedure, respectively. In the BMA column, we report the posterior inclusion probability for each variable and the posterior expected value of the corresponding parameter. Also, the tables show the ratio of the posterior expected value of the parameter to the root of the posterior variance of the parameter. This can be interpreted as a measure of estimate precision, analogous to the t -ratio in classical econometrics. It should be borne in mind that the two sub-columns under BMA – the inclusion probability and the Bayesian counterpart to the t -ratio – convey very different sorts of information. While the inclusion probabil-

¹⁹ For a detailed description of the BMA procedure, see e.g. Crespo Cuaresma and Slačik (2007). The Markov Chain Monte Carlo Model Composite (MC³) algorithm with 10,000 replications was used to reduce the model space (see Crespo Cuaresma and Slačik, 2008).

²⁰ It is also possible to combine the Bayesian and classical (frequentist) approaches and use the BMA as a model selection criterion. One would thus simply rerun the estimation with only those regressors whose model averaged parameters have an inclusion probability equal to or greater than the prior benchmark of 0.5.

ity indicates whether a particular variable belongs to the true specification or not, the t -ratio provides information on the precision with which the effect of the regressor in question may be estimated. Hence, the inclusion probability does not necessarily have to be positively correlated with what would correspond to the concept of significance in classical econometrics.

Moving on to the interpretation of the results, for the Czech Republic all three approaches suggest that inflation is persistent in the short run (i.e. the first lag of the dependent variable). According to the p -value and SIC approach, inflation also rises with the output gap of the previous quarter but the BMA procedure does not suggest a sufficiently robust impact of this variable.²¹ In contrast, higher lags of inflation and, surprisingly enough, also strong monetary growth (if going by the BMA results) decrease the pressure on prices at higher lags. However, the effect of the 10th lag of our McCallum indicator is not precisely estimated. Indeed, the negative impact is likely to result from the short sample, which leads to instability in the models. We emphasize that the robustness of the monetary variable in the Bayesian procedure (regardless of the sign) suggests that it significantly enters the inflation equation and therefore should be taken into account in the evaluation of price pressures. In addition to these findings, the p -value-based model selection also suggests some negative effect of the third lag of the nominal effective exchange rate, as appreciation puts downward pressure on inflation. This exchange rate pass-through, however, seems to be a matter of coincidence as the posterior inclusion probability for both lags of the nominal exchange rate is well below the 0.5 threshold (as determined by our prior on the inclusion probability of each variable).

In the case of Poland, inflation is also persistent in the short run and it rises with the past quarter's positive output gap, which, unlike in the Czech Republic, shows up robustly under BMA. A positive off-equilibrium growth of the monetary base increases inflationary pressure with a 2.5-year lag, although the estimate is somewhat imprecise. The p -value- and SIC-based approaches suggest that inflation accelerates also with shorter lags of excessive monetary growth. For example, the long-term effect of money on inflation in the p -value-based approach amounts to 0.24, so that a 1 percentage point monetary base growth in excess of the McCallum rule increases inflation by 0.24 percentage points. All three approaches indicate that there is no significant pass-through from nominal effective exchange rate movements into consumer prices.

The situation looks slightly different in the case of Slovakia. Except for the first and the third inflation lag no other variable surpassed the 10% significance level under the p -value procedure. As in the Czech case, the two lags of inflation have a positive and a negative sign, respectively. However, according to the SIC and, more importantly, the BMA approach, the monetary indicator shows up with a positive sign at the 10th lag. Although the precision of the estimate is rather low, it still suggests that money growth in excess of the McCallum rule increases inflation in the long run. Under the BMA the short-term exchange rate pass-through just misses the 0.5 threshold. None of the applied methodologies identifies the output gap as a robust inflation determinant for Slovakia.

²¹ *The insignificance of the output gap for the Czech Republic is in line with Slačik (2008).*

Turning our attention to Hungary, it is striking that none of the three methodologies includes the dummy variable corresponding to the level shift in the base money series in the “true” model. While inflation is persistent in the short run, the output gap has no impact on inflation, as in the case of Slovakia and, judging by BMA, the Czech Republic.²² Moreover, yet again none of the selection procedures detects any effect of the nominal effective exchange rate on inflation. The measure of excessive money growth does show up under the SIC and, most importantly, the BMA procedure. However, only the 10th lag of the indicator turns out robust and very precise with a negative sign, which may be interpreted similarly to the Czech case above.

4.3 Robustness Checks²³

Given that monetary base growth as such may also be indicative of future inflation pressures, it is of interest to estimate the models by substituting the McCallum-motivated measure of excess liquidity by year-on-year monetary base growth. This also allows for a longer estimation sample, as the computation of the four-year average change in velocity is not necessary. We find that the estimation results are largely similar for all other variables except, interestingly, the monetary variable. Indeed, the Bayesian method does not identify ordinary growth in the monetary base as a robust regressor for any of the four economies. It should be noted that the speed of base money growth as such does not provide indication about whether monetary policy is contractionary or expansionary. In contrast, information about the policy stance is obtainable by comparing the actual growth in base money to the growth proposed by the McCallum rule. This provides further support for the selection of our rule-based measure as the benchmark monetary indicator.

As noted in section 2, some studies assess the inflationary impact of trend money growth, motivated by the assumption that what matters are long-term trends of money rather than short-term fluctuations. We have calculated a measure for trend money growth for the four economies using two different methodologies. In the first, a Hodrick-Prescott filter is applied to the monetary base (in logarithms), and the resulting trend is differenced once. As the second measure, we first take the differences of the monetary base variable and then apply the Hodrick-Prescott filter to the growth rates. Both measures provide similar results. For the Czech Republic and Poland, trend money growth is not identified as a robust determinant of inflation pressures, whereas other regressors remain robust. For Slovakia, trend money growth appears as a significant variable in the regression. Finally, for Hungary, the results from the Bayesian estimation are very unstable, possibly due to the inclusion of the dummy variable that further reduces the low number of degrees of freedom in the sample. In sum, trend money growth provides less information for inflation pressures than the McCallum rule-based indicator, which is the focus of the study.

²² *The limited significance of the output gap is echoed in Égert (2007), where the author states that the business cycle is a less robust determinant of inflation in transition economies than in the euro area. Moreover, in small open economies external factors typically play a strong role in inflation developments, with a weaker influence of domestic output gaps.*

²³ *The detailed estimation output for all robustness checks is available from the authors upon request.*

Finally, we have assessed the possibility that excess liquidity calculated in terms of broader money aggregates would be conducive to inflation pressures. Unfortunately, time series long enough for the computation of excess liquidity with the McCallum measure exist only for the Czech Republic. Moreover, it should be noted that while the monetary base is fully controllable by the monetary authorities, making the McCallum rule operational, this cannot be said of broader monetary aggregates. We find that for both M1 and M2, the results practically do not differ from those obtained in the benchmark estimation (i.e. with base money), although the estimation precision is much higher under the M1-based indicator.

In sum, monetary base growth in excess of the McCallum rule provides robust information about future inflation over a ten-quarter horizon for all four analyzed countries. These results thus suggest that a McCallum rule could potentially be used as an additional indicator of the monetary policy stance in the future.

5 Conclusion

In this paper, we have examined the monetary determinants of inflation in four Central and Eastern European EU Member States. The novelty of the study is that we have used a monetary indicator based on a simulated McCallum money supply rule for the four economies. Then, in a backward-looking Phillips curve framework, we included the deviation of actual base money growth from the policy rule to investigate its impact on inflation in the medium to long run. The variables and their lags were selected by means of three various algorithms, of which our primary focus is on the Bayesian model averaging technique, due to its comprehensiveness and favorable robustness properties. We found that actual money growth in relation to the rule provides information about inflation developments over a horizon of ten quarters for all four investigated countries.

Our focus is on four economies that are pursuing or have until recently pursued inflation targeting, which makes the comparison of actual policy with that proposed by the McCallum rule interesting. Nevertheless, and pertaining to the estimation of the Phillips curves, there is no a priori reason to assume that the significance of a monetary variable in the estimation would depend on the actual policy regime of the central bank. As Galí (2003) points out, the relationship between money and prices simply follows from a long-term money demand relationship, when trend growth in output is determined by nonmonetary factors. This holds irrespectively of the monetary policy regime in place. Moreover, if we take the McCallum rule seriously, then any deviation of money from the rule would simply signal an expansionary or contractionary policy stance, with expected impacts on inflation with some time lag.

Finally, our results point to an important indicator role of money as one of the variables that deserve to be analyzed by the central bank in maintaining price stability, particularly in the future once the precision of the estimation improves with more data available. This is especially the case as an inflation targeting regime – as currently in place in the Czech Republic, Hungary and Poland – is flexible and can quickly react to various shocks and signals of inflationary pressures in the economy.

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Appendix

Table 1

	BMA-based		P-value-based	SIC-based
	PIP	$E(\beta Y)$		
		$\left(\frac{E(\beta Y)}{\sqrt{\text{var}(\beta Y)}}\right)$		
π_{t-1}	1.000	0.995 -11.987	0.890*** -12.445	0.997*** -16.599
π_{t-3}	0.987	-0.500 (-4.618)	-0.355*** (-4.800)	-0.404*** (-4.868)
y_{t-1}	0.238	40.478 -1.829	59.141*** -2.751	54.377** -2.550
y_{t-3}	0.048	29.314 -1.236		
Δe_{t-1}	0.007	-0.043 (-0.760)		
Δe_{t-3}	0.008	-0.018 (-0.528)	-0.057* (-1.943)	
m_{t-4}	0.062	0.045 -1.535	0.041* -1.885	0.029 -1.614
m_{t-6}	0.181	-0.052 (-1.794)		
m_{t-10}	0.999	-0.042 (-0.995)		
α			1.431*** -3.981	1.042*** -3.848
Adj. R-squared			0.873	0.864
Obs.	Varies with model length		34	34

Table 2

	BMA-based		P-value-based	SIC-based
	PIP	$E(\beta|Y)$		
		$\left(\frac{E(\beta|Y)}{\sqrt{\text{var}(\beta|Y)}}\right)$		
π_{t-1}	1.000	1.000 -9.509	1.000*** -10.073	1.037*** -13.925
π_{t-3}	0.703	-0.315 (-10.041)	-0.221*** (-3.140)	-0.305*** (-6.434)
y_{t-1}	0.007	3.617 (0.390)		
y_{t-3}	0.011	-12.710 (-0.658)		
Δe_{t-1}	0.429	-0.025 (-0.493)		
Δe_{t-3}	0.005	-0.004 (-0.085)		
m_{t-4}	0.008	0.005 (0.535)		
m_{t-6}	0.006	0.001 (0.141)		
m_{t-10}	1.000	0.026 -1.298		0.018 -1.276
α			1.365*** -2.647	1.285** -2.405
Adj. R-squared			0.749	0.791
Obs.	Varies with model length		41	41

Note: Estimation results are based on the Bayesian model averaging algorithm (second column), our primary approach, and, for the sake of completeness, on the p-value (third column) and on the Schwarz information criterion (fourth column). Numbers in parentheses display the t-statistic for the respective parameters or, in the case of BMA, the analogy to a t-statistic. PIP stands for the posterior inclusion probability, our major quality indicator as explained in the text.

***/**/* mark the 1%, 5% and 10% significance level respectively.

Note: As in table 1.

Table 3

Poland

	BMA-based		P-value-based	SIC-based
	PIP	$E(\beta|Y)$ $\left(\frac{E(\beta|Y)}{\sqrt{\text{var}(\beta|Y)}} \right)$		
π_{t-1}	1.000	0.636 -7.818	0.725*** -9.878	0.725*** -9.314
π_{t-3}	0.006	-0.007 (-0.088)		
y_{t-1}	0.995	51.825 -4.908	44.472*** -4.399	45.517*** -4.199
y_{t-3}	0.004	-0.874 (-0.061)		
Δe_{t-1}	0.045	-0.024 (-1.257)		
Δe_{t-3}	0.025	-0.016 (-1.081)		
m_{t-4}	0.118	0.027 -1.635	0.026** -2.085	0.032** -2.553
m_{t-6}	0.048	0.017 -1.417	0.018** -2.473	
m_{t-10}	1.000	0.018 -1.432	0.022** -1.979	0.019* -1.681
α			0.801*** -3.697	0.807*** -3.096
Adj. R-squared			0.833	0.820
Obs.	Varies with model length		27	27

Note: As in table 1.

Table 4

Hungary

	BMA-based		P-value-based	SIC-based
	PIP	$E(\beta|Y)$ $\left(\frac{E(\beta|Y)}{\sqrt{\text{var}(\beta|Y)}} \right)$		
π_{t-1}	0.996	0.560 -3.401	0.554*** -3.392	0.729*** -9.006
π_{t-3}	0.009	-0.037 (-0.312)		
y_{t-1}	0.076	50.340 -1.204		
y_{t-3}	0.006	3.269 (0.132)		
Δe_{t-1}	0.026	-0.040 (-0.718)		
Δe_{t-3}	0.015	-0.032 (-0.646)		
m_{t-4}	0.008	0.012 (0.475)		
m_{t-6}	0.005	0.002 (0.097)		
m_{t-10}	1.000	-0.073 (-2.703)	-0.072*** (-2.722)	-0.095** (-2.540)
2001-dummy	0.007	-0.104 (-0.291)		
α			2.442** -2.495	1.764** -2.467
Adj. R-squared			0.456	0.851
Obs.	Varies with model length		27	27

Note: As in table 1.

Economic Growth Determinants for European Regions: Is Central and Eastern Europe Different?

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We investigate the robustness of economic growth determinants for European regions in the period from 1995 to 2005. In particular we focus on the systematic differences in growth triggers for Central and Eastern European (CEE) regions as compared to regions belonging to the older EU Member States. Our method is based on the Bayesian model averaging of cross-sectional growth regressions, where we draw attention to (1) the spatial correlation structure of economic growth among European regions and (2) model uncertainty. The spatial autoregressive model (SAR) is employed to capture growth spillovers among European regions. We find that the regional income convergence process between countries is dominated by the catching-up process of CEE regions. Human capital, measured as the population share of highly educated workers, and income convergence appear to be robust driving forces of income growth. Capital cities grow faster, on average, with an additional growth bonus for those located in CEE. On top of this, the spatial model specification reveals a range of infrastructure variables as important growth determinants. Our results are robust with respect to different econometric model specifications.

JEL classification: C11, C15, C21, R11, O52

Keywords: Model uncertainty, spatial autoregressive model, determinants of economic growth, European regions

1 Introduction

In this paper we investigate the determinants of economic growth in European regions in the period from 1995 to 2005 with a special focus on the subset of Central and Eastern European (CEE) regions. We identify growth drivers for regions *between* countries as well as for regions *within* countries of the EU-27. Econometric inference concerning the determinants of economic growth depends strongly on the spatial disaggregation level at which economic units (countries, regions, cities, etc.) are observed.² In this contribution, we concentrate on economic growth patterns in Europe at the regional level. Barro and Sala-i-Martin (1991) test for convergence of income per capita among European regions between 1950 and 1985 and find that the speed of income convergence is almost 2% and relatively constant both over time and also across countries.

Determinants of regional growth and convergence patterns have been studied by Boldrin and Canova (2001), who investigate income convergence and its relationship to regional policies, concluding with a critical assessment of regional economic policies. Canova (2004) tests for convergence clubs in European regions and finds evidence for convergence poles characterized by different economic conditions. Corrado et al. (2005) use an alternative technique to identify clusters of convergence in European regions and sectors. Becker et al. (2008) find evidence

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² Barro (1991) and Sala-i-Martin et al. (2004) give an excellent overview of empirical analysis for regional data and cross-sections of countries.

for growth (but not employment) effects for regions receiving structural funds. Basile (2008) finds positive (nonlinear) effects of schooling for EU-15 regions, whereas LeSage and Fischer's (2008) results indicate that industry diversity impacts negatively on European growth rates and that there is no evidence that human capital is robustly related to economic growth. A detailed study focusing on the identification of policy levers in the CEE regions to attain sustainable growth rates has been carried out by the European Commission (2004). The results show decreasing income inequality *between* regions of different countries, whereas increasing trends in inequality are found *within* CEE countries. This is confirmed by the results in Béla (2007), who shows that in the early stage of catching up, regional inequalities tend to increase.

An important challenge the empirical economic growth literature faces is that theories of economic growth are often not mutually exclusive and the validity of one theory does not necessarily imply that another theory is false. Brock and Durlauf (2001) refer to this problem as the "open-endedness" of growth theories. Hence theory is of little guidance regarding which variables should be included in the analysis, and empirical results point to different growth determinants. Over 140 different variables have been used in country-based empirical growth studies since the 1990s (Durlauf et al., 2005). Empirical models of economic growth are therefore plagued by the problem of *model uncertainty* concerning the choice of explanatory variables and model specification.

In this paper we will deal with model uncertainty in regional growth regressions by applying Bayesian model averaging (BMA). The strength of BMA is rooted in the statistically sound way in which model uncertainty is overcome. Basing inference on a weighted average across sufficiently many models as opposed to picking a single best model provides a robust modeling strategy, with weights arising naturally in the Bayesian framework as the posterior model probabilities.³ As such, BMA has received a lot of attention in the statistical literature (e.g. Raftery, 1995) and became popular among econometricians in the field of growth empirics (Sala-i-Martin et al., 2004, and Fernández et al., 2001b). A very recent literature has developed Bayesian tools in the analysis of spatially correlated data. The location and interaction of observations (countries, regions) might play a crucial role from a statistical point of view as well as regarding the economic interpretation of growth drivers. Spatial models have been already widely applied in the context of growth regressions (e.g. Fischer and Stirböck, 2006, and Niebuhr, 2001) and allow the researcher to interpret the source and strength of spatial dependence. LeSage and Fischer (2008) apply BMA to investigate determinants of income in EU regions, with particular emphasis on sectoral factors. In our model specifications we explicitly model spatial effects using the method put forward by LeSage and Parent (2007).

We contribute to the literature as follows: First, we investigate a set of 60 potential growth determinants in 255 NUTS 2 regions of the EU, which represents a much larger dataset than in the available empirical literature (see the annex for a list of variables and data sources). Second, we use BMA to investigate the robustness of regional growth determinants with an emphasis on spatial modeling, using SAR and different prior assumptions. Third, we allow for heterogeneity by

³ See Doppelhofer (2008) for a discussion of both Bayesian and frequentist techniques.

estimating different elasticities of economic growth to some selected determinants in CEE EU Member States. Furthermore, we use a new methodology to assess parameter heterogeneity based on the strong heredity principle when constructing the prior over space of potential models. Fourth, we allow also for uncertainty over spatial weights by conducting a sensitivity analysis with respect to alternative spatial distance measures. While most studies using spatial models stick to a single spatial structure, we confirm the robustness of our results to the use of different spatial matrices.

The paper is structured as follows. Section 2 presents the setting of the BMA exercise carried out in the paper, while section 3 shows the empirical set-up and the choice of the interaction terms. Section 4 presents the empirical results concerning the robustness of growth determinants in the EU at the regional level. Section 5 checks for the robustness of the results to variations in the spatial weighting matrix and in the nature of the potential parameter heterogeneity. Section 6 concludes.

2 The Econometric Model: Specification and Prior Structures

In order to investigate the robustness of potential determinants of regional economic growth, we propose using models that can be nested within a general spatial autoregressive model (SAR) of the form:

$$y = \alpha \mathbf{1}_N + \rho W y + X_k \bar{\beta}_k + \varepsilon, \quad (1)$$

where y is an N -dimensional column vector of growth rates of income per capita for N regions, α is the intercept term, $\mathbf{1}_N$ is an N -dimensional column vector of ones, $X_k = (x_1 \dots x_k)$ is a matrix whose columns are stacked data for k explanatory variables, $\bar{\beta}_k = (\beta_1 \dots \beta_k)'$ is the k -dimensional parameter vector corresponding to the variables in X_k , W specifies the spatial dependence structure among y observations, ρ is a scalar indicating the degree of spatial autocorrelation and ε is an error term which may contain country-specific fixed effects.⁴ For the moment, let us assume ε to be an N -dimensional shock process with zero mean and a diagonal variance-covariance matrix $\Sigma = \sigma^2 I_N$.

Spatial dependence can be attributed to economic interactions such as trade or commuting between observations (e.g. countries, regions). From a more statistical point of view, omitted variables can cause residual spatial autocorrelation. Hence standard regression techniques lead to inefficient or biased estimates (Anselin, 1988) under the presence of spatial correlation. Note that there exist several ways of specifying the correlation structure among the observations. We assume that observations (regions) are tied to each other by an inverse distance relationship. Thus the similarity of regions decreases with distance. A typical element of W is then given by $[W]_{ij} = d_{ij}^{-1}$ for $i \neq j$ and $[W]_{ii} = 0$, where d_{ij} is the distance between observation i and observation j . We use airline distances measured in kilometers, although any other distance metric could be embedded into the analysis as well (e.g. travel times). Since our inference in the spatial set-up will be conditional upon the spatial link matrix, a sensitivity analysis is essential when drawing con-

⁴ The generalization of the BMA strategy here to other error structures with fixed effects is straightforward after application of the Frisch-Waugh-Lovell theorem. In a panel setting, the estimation of fixed-effect models can be carried out by estimating the model proposed above using within-transformed data.

clusions. We also introduce later a different way of specifying neighborhood relationships and carry out a robustness analysis.

The number and identity of the variables in X_k is assumed unknown so that the columns in X_k are taken to be k variables from a larger set of K potential explanatory variables, grouped in X_K , with $K \geq k$. A model in our setting $M_k \in M$ is defined by the choice of a group of variables (and thus, the size of the model), so $\text{card}(M) = 2^K$. Inference on the parameters attached to the variables in X_k , which explicitly takes into account model uncertainty, can be thus based on weighted-averaged parameter estimates of individual models,

$$p(\beta_j | Y) = \sum_{k=1}^{2^K} p(\beta_j | Y, M_k) p(M_k | Y), \quad (2)$$

with Y denoting the data. Posterior model probabilities $p(M_k | Y)$ constituting the weights in equation (2) are given by

$$p(M_j | Y) = \frac{p(Y | M_j) p(M_j)}{\sum_{k=1}^{2^K} p(Y | M_k) p(M_k)}. \quad (3)$$

In the empirical application we are interested in the following statistics for a variable x_k . The *posterior inclusion probability (PIP)* is given by the sum of probabilities of models including variable x_k . Hence it reflects the variable's relative importance in explaining the phenomenon under study – in our case the growth process. The *posterior mean* of the distribution of β_k (PM) is the sum of model-weighted means of the model-specific posterior distributions of the parameter

$$E(\beta_k | \mathbf{Y}) = \sum_{l=1}^{2^K} p(M_l | Y) E(\beta_k | \mathbf{Y}, M_l).$$

The *posterior standard deviation (PSD)* of β_k is the square root of the model-weighted sum of conditional variances plus an additional term capturing the uncertainty of the (estimated) posterior mean across models.

We have to decide how to elicit prior structures in order to calculate the sum in equation (2). In most empirical applications the cardinality of the model space renders direct evaluation of equation (2) infeasible. Markov Chain Monte Carlo Model Composition (MC3) algorithms evaluate subsets of the model space with non-negligible posterior mass. This stochastic search algorithm traverses the model space, thereby visiting the models in the “right proportion” in the sense that models with high posterior model probabilities are frequented more often than those to which small posterior model probabilities are attributed. Furthermore we have to put priors on the coefficient vector, the variance and the model space. In this paper, we use the benchmark prior structures on the parameter space based on Fernández et al. (2001a), coupled with the hierarchical prior distribution over the model size used by Ley and Steel (2009). For more details see the annex and Crespo Cuaresma et al. (2009).

We also improve on past attempts to assess parameter heterogeneity⁵ by using a particular prior over the model space that fulfills the *strong heredity principle* put forward by Chipman (1996) and which is aimed at assessing the importance of interaction terms in BMA. We implement this prior using a modified sampling procedure in the MC3 algorithm. In particular, under strong heredity, we only assign positive prior inclusion probabilities to models that (1) do not include interaction terms and (2) include *all* variables related to the interactions. To be more specific, if the term $A*B$ (interacting variables A and B multiplicatively) enters the regression, variables A and B will also be part of the model. Thus we ensure that variables A , B and $A*B$ enter the regression jointly for the evaluation of interaction terms, so as to ensure that only the independent effect of the interaction is evaluated. Our design implies that we are removing the prior probability mass from all the models where interactions are present but the corresponding linear terms are not part of the model. Crespo Cuaresma (2008) points out that this approach can protect the analysis from spuriously detected interaction effects.

3 The Empirical Setting: Variables and Interactions

Table 2 lists the full set of available variables, together with a brief definition and the source for each one of them. The dataset covers information on 255 European regions, and each income growth observation refers to the average annual growth rate in the period from 1995 to 2005, deflated by national price data. Note that over the larger part of the sample period, the CEE regions have not yet been EU members. This implies that potential structural breaks related to formal EU membership play a negligible role in this dataset.⁶ The set of variables can be roughly divided into variables approximating *factor accumulation and convergence* (the usual economic growth determinants implied by the original Solow growth model), *human capital* variables, *technological innovation* variables, variables measuring *sectoral structure and employment*, *infrastructure* and *socio-geographical* variables. Wherever possible, variables are measured at their initial levels in order to limit the potential endogeneity of some of our explanatory variables.

We aim at assessing the potential differences between determinants of economic growth differences both across regions in different European countries and regions within a given country. Therefore the BMA exercise is carried out using both a single intercept term in the specification and country-specific intercepts, i.e. country-fixed effects. As a benchmark comparison, we report results based on the specification without a spatial correlation structure. The evaluation of nonlinearities in the regional growth processes is assessed using interactions of pairs of variables as extra explanatory variables. Model averaging in a model space which includes specifications with interacted variables takes place following the strong heredity principle described above.

⁵ See Crespo Cuaresma and Doppelhofer (2007) and Doppelhofer and Weeks (2009) for recent contributions to parameter heterogeneity in the framework of BMA.

⁶ See Crespo Cuaresma et al. (2008) for an assessment of EU membership as a growth determinant.

4 Estimation Results

Table 1 presents the BMA results for three model specifications: Model 1 is the baseline estimation excluding both the spatial autoregressive lag and country-fixed effects. Model 2 incorporates country-fixed effects, and model 3 is the SAR. The SAR model is estimated without country-fixed effects, since the within transformation imposes some spatial structure a priori, which makes the SAR term not properly interpretable. Consequently, model 2 assumes that regions interact solely within countries and neglects any correlation that results from economic interaction beyond the countries' borders. The structure of the table is as follows: In each column we report the posterior inclusion probabilities of each regressor, together with the mean and standard deviation of the posterior distribution for the associated parameter. In all cases we use a Binomial-Beta prior for model size with an expected size equal to seven regressors. Due to the hierarchical prior structure imposed over the model size, our results do not appear sensitive to the choice of this hyperparameter. The expected mean model size of seven regressors selected from a set of 60 candidate explanatory variables implies a prior inclusion probability of 7/60, which is approximately 0.10. Consequently variables with posterior inclusion probability (PIP) exceeding the prior of 10% are highlighted in bold font. We assess the issue of parameter heterogeneity between Eastern and Western European regions by explicitly including a dummy variable for regions belonging to CEE (Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovenia and Slovakia). The dummy is (linearly) interacted with initial income per capita, capital formation, population growth, access to roads, output density, capital cities, the share of highly educated labor, population density and employment density. In particular, these variables reflect the three Solow model variables (initial income per capita, capital formation and population growth), an infrastructure variable (road access), a human capital/technology innovation variable (share of highly educated labor), three variables measuring production polarization (output, population and employment density) and a dummy variable for capital cities.⁷

4.1 Cross-Section of Regions

Model 1 reveals a model-averaged estimate of the speed of convergence⁸ – i.e. the rate at which per capita income in a region approaches its steady state relative to its distance from its steady state – of around 0.4%. Note that this estimate contains information on the convergence process of European income per capita both within and between countries. In this sense, it is not surprising that the estimate implies such a slow convergence process to the steady state: A higher speed of convergence is obtained below for the case of country-specific intercepts (and thus country-specific steady states). Furthermore, including the CEE dummy in the set of regressors shows that the precision of the estimate is strongly affected by the

⁷ We decided to include only a limited set of interactions so as to avoid models in which too many parameters would have to be estimated exclusively in the CEE subsample. Model spaces which include specifications with too many interactions as well as running two separate regressions for the CEE and non-CEE subsamples would result in many models which run out of degrees of freedom.

⁸ Log-linearizing a standard neoclassical (Solow) growth model around a steady state implies a coefficient $\beta = -(1 - e^{-\gamma T})/T$ for the logarithm of initial income (see Barro and Sala-i-Martin, 1991). The speed of convergence γ is therefore given by $\ln(1 + \beta T)/T$, where the number of years T is 10 in this paper.

growth experience of CEE countries.⁹ This suggests that income convergence is mainly driven by the catching-up process of CEE regions, as can be further seen by the large inclusion probability of the CEE dummy. Some variables present a robust (partial) correlation with growth: a proxy for human capital (the share of highly educated labor), a gravity/spatial measure (the distance to Frankfurt) and the interaction of the CEE dummy with the capital city dummy. The positive effect of human capital on economic growth is reflected in a robust positive parameter estimate attached to the variable quantifying the highly educated share in the working-age population. The empirical literature concerning the importance of human capital accumulation for economic growth provides very mixed results both at the country level (see the important contribution by Krueger and Lindahl, 1999) and at the regional level. Focusing on the recent empirical literature dealing with regional growth, LeSage and Fischer (2008), for instance, find no significant effects of education on growth, while Sterlacchini (2008) concludes that human capital and R&D are the most effective growth-enhancing factors in Western European regions. Nonlinear effects of human capital on economic growth are found by Basile (2008). Since these deviations can be at least partly attributed to differences in the model employed (as well as in the data set), the use of techniques which are robust to model uncertainty is particularly important when studying the relationship between education and economic development at the regional level.

The size of the model-averaged estimate implies that on average a 10% increase in the share of highly educated people in the working-age population is associated with a 0.5% higher growth rate of GDP per capita. The caveats mentioned in Vandebussche et al. (2006) regarding the comparability of this proxy are however in place. In principle, a proportion of the variations in the shares of highly educated people – measured as those who completed tertiary education – might be attributed to the fact that education systems vary across countries. Notice however that this variable remains important in explaining growth differences also in the specification including country-fixed effects (see below), where heterogeneity in national education systems is controlled for.

The significant interaction term with capital cities can be interpreted as confirming the theory put forward by Williamson (1965) and empirically confirmed by Béla (2007), which states that in an early stage of catching up, regional inequalities within countries increase. This is also in line with the results found by the European Commission (2004). A possible explanation is the general scarcity of infrastructure that countries face at the beginning of the convergence process. As countries are catching up, agglomerations (e.g. capital cities) become congested. Due to diminishing returns to scale, other backward regions become more attractive for investment, leading to regional convergence. Our results confirm this phenomenon, indicating that CEE regions are in an earlier stage of convergence than the old EU Member States. The data reveal that capital cities in CEE regions (agglomerations) gain a growth bonus that is about four times higher than for non-CEE capital cities. Furthermore the positive coefficient on the CEE dummy shows that on average these regions grow faster than the rest of the sample.

⁹ Estimation results are available from the authors upon request.

4.2 Cross-Section of Regions with Country-Fixed Effects

In model 2 we repeat the same exercise using a specification including country-fixed effects, and thus concentrating on the determinants of economic growth *within* countries for European regions. It should be noted that the dynamics of convergence in this specification are to be interpreted as taking place in regions within a country towards a country-specific steady state. Furthermore country-fixed effects account for unobserved country-specific characteristics which affect the process of economic growth and are assumed to be equal across regions. Variables that are country-specific are thus conditioned out and should yield no posterior support. Note that the strong heredity principle can, by construction, lead to a large posterior inclusion probability of the CEE dummy in case that there are important interaction variables. However, if it is only the interaction that matters, the effect (i.e. the coefficient) of the dummy should be close to zero. There are some differences between the determinants of economic growth implied by the differences *between* regions and those of regions *within* a given country. For the first time an infrastructure variable appears strongly related to growth (INTF). Model 2 further indicates that human capital remains a robust determinant of growth in this setting, although the parameter is not as well estimated as in the case without country-fixed effects. This result is not surprising, given that a large part of the variation in educational outcomes is driven by cross-country differences (as opposed to cross-regional differences within countries). A 10% increase in the highly educated share in the labor force in CEE regions leads to a remarkable growth bonus of 1.2%.

4.3 Results with Spatial Autocorrelation

The model with country-fixed effects presented above assesses the issue of spatial correlation of income growth by assuming a country-specific intercept, common to all regions within a country, in the economic growth process. To the extent that country borders are not a large obstacle in the growth process of EU regions, country-fixed effects may not be the best way to model spatial relationships in our dataset. Alternatively, we use actual geographical distances in the framework of SAR models such as those presented above to relate the growth process of different regions.

The very right column in table 1 presents the results of the BMA exercise for the SAR model (without country-fixed effects). The number of robust variables when spatial autocorrelation is explicitly modeled is higher than in any other setting, with a posterior mean of model size around 9. With a coefficient of approximately 0.6, the model-averaged estimate of ρ points to positive spillovers among European regions. Thus regions benefit from a neighborhood that is characterized by high growth rates. The results obtained in the specifications without spatial autocorrelation are still present in the estimates from the SAR model: Regions with capital cities, regions with lower income and regions with a relatively educated labor force tend to present higher growth rates of income. On top of this result, there is also evidence of the importance of infrastructure variables and socio-geographical variables as determinants of long-run growth. In terms of economic growth, regions also profit from a growing population. Taking spatial autocorrelation into account, there is no robust parameter heterogeneity in the speed of income convergence. The CEE region dummy does no longer appear

robustly related to growth since we explicitly modeled the spatial arrangement of the data by the econometric framework we set up.

The issue of the estimates of income convergence speed under spatial autocorrelation deserves further comment. If spatial spillovers are not included in the specification but exist in the data, the speed of convergence will tend to be overestimated (see Crespo Cuaresma and Feldkircher, 2009). In this sense, the choice of a spatial link matrix is particularly important in order to get reliable estimates of the speed of convergence. Crespo Cuaresma and Feldkircher (2009) analyze this issue by allowing uncertainty concerning the spatial link matrix. While our results here are derived using an inverse distance matrix, in the following subsection we perform a robustness analysis using other spatial link matrices.¹⁰

5 Robustness Checks

In this section we allow for a different setting in the neighborhood specification so as to ensure that the results presented above are robust with respect to the connectivity matrix. Economic theory does not offer any guidance concerning a particular choice of spatial weighting matrix W . While the inverse distance matrix used hitherto is a recurrent choice in spatial econometric applications, it can be thought of as a special case of a more general weighting matrix $W(\phi)$ with a characteristic element

$$[W]_{ij} = [d_{ij}]^{-\phi}, \quad (5)$$

where d_{ij} is the distance between regions i and j and the parameter ϕ embodies the sensitivity of weights to distance, and thus the decay of the weighting scheme. The benchmark value ($\phi=1$) implies that weights are an inverse function of distance, while higher values of ϕ lead to a stronger decay of weights with distance. Using inverse distance weighting, one needs to specify “centers of economic activities,” where we use the region’s capital cities. This can be circumvented when using binary contiguity matrices as weighting schemes. Here neighborhood is defined by the regions sharing a common border (or vertex). A first-order queen contiguity matrix therefore reflects spatial interactions of contiguous regions only. This implies that growth developments in a given region are affected by the growth process in all (first-order) contiguous regions and not by those that do not share a common border with the region under consideration. A typical element of W for two neighboring regions is then given by $[W]_{ij}=1$ for $i \neq j$, $[W]_{ij}=0$ and $[W]_{ij}=0$ for i and j not sharing a common border. A second-order queen contiguity matrix assigns positive (equal) weights not only to contiguous regions but also to the neighbors of the neighbors. The main difference to inverse distance weighting lies in the common treatment of neighbors by assigning equal weights.

To test the sensitivity of our results, we repeat the BMA exercise for the parameter value $\phi=2$, which implies a faster decay of weights with distance. We also obtain results from imposing contiguity weights using a first-order and

¹⁰ Pfaffermayr (2009) shows, furthermore, that local spatial interactions in the Solow model lead to heterogeneity in the speed of convergence. Further empirical research in this field could profit from the methods presented in this paper as well as those in Crespo Cuaresma and Feldkircher (2009).

second-order queen contiguity matrix.¹¹ Chart 1 summarizes the results of the robustness exercise by plotting the PIP corresponding to each variable for the cases $\phi=1,2$ and for the first- and second-order queen contiguity matrices. Posterior inclusion probabilities of the regressors in our analysis are surprisingly insensitive to alternative weighting matrices. The same applies to statistical and economic inference, measured by standardized coefficients (PM/PSD): No qualitative changes for varied weighting designs can be detected.¹²

6 Conclusions

We analyze the nature of robust determinants of economic growth in EU regions in the presence of model uncertainty using model averaging techniques. Our paper contains some important novelties compared to previous studies on the topic. On the one hand, we use the most comprehensive dataset existing (to our knowledge) on potential determinants of economic growth in European regions. On the other hand, we apply the most recent Bayesian model averaging techniques to assess the robustness of growth determinants. In particular, we use spatial autoregressive structures, hyperpriors on model size to robustify the prior choice on the model space and introduce a new methodology to treat the issue of sub-sample parameter heterogeneity.

We find evidence for conditional convergence across European regions both between regions of different countries and between regions within individual countries. In the cross-section of regions with spatial specification, the estimated speed of convergence is around 1.3%. However, the precision of the estimated speed of convergence is strongly affected by the growth experience of CEE countries. The convergence process *between* regions is dominated by the catching-up process of regions in CEE. In all model specifications, the growth rate of income per capita is higher in regions with capital cities than it is in non-capital city regions, after controlling for all other factors. On top of this, there is an additional growth bonus for capital cities in CEE regions. Allowing for spatial autocorrelation a priori, we find evidence for positive spatial spillovers in EU regions. These growth clusters have become a stylized fact in the empirical literature on economic growth (e.g. LeSage and Fischer, 2008).

The interaction between growth and output agglomeration deserves further analysis. Williamson (1965) states that in countries in an early stage of catching up, the growth push in economic activity should be concentrated in few poles (for instance, urban agglomerations around capital cities).

Regarding regional growth determinants, our results imply that human capital, conditional income convergence and – to a minor extent – infrastructure variables appear as the most robust driving forces of income across European regions.

¹¹ Detailed results are available upon request from the authors. Variations for the coefficient attached to initial income (GDPCAPO) might be due to multicollinearity with the CEE dummy variable.

¹² Brock and Durlauf (2001) discuss a decision-theoretic foundation for using such standardized coefficients. In Masanjala and Papageorgiou (2008), for instance, explanatory variables with values of $|PM/PSD|$ above 1.3 are dubbed “effective.”

The importance of education as a growth engine appears clearly in the data and is also robust to the use of different spatial weight matrices.¹³ Our estimates imply that an increase of 10% in the share of highly educated people in the working-age population leads to a rise in GDP per capita growth by 0.5% on average. The positive effect of human capital remains a robust determinant of regional growth *within* countries, but the parameter is not as well estimated as in the case without country-fixed effects. On top of this, regions belonging to CEE countries achieve on average higher returns to human capital. When it comes to policy choices, this result gives clear indications concerning the importance of policies aimed at increasing education levels as a key component of policy strategies toward sustainable long-term growth rates of income in CEE. Besides the fact that human capital accumulation appears to be a robust driver of growth, the differences in returns to education in terms of growth (which could be seen as an empirical sign concerning a certain degree of skill mismatch) implies that CEE regions can profit overproportionately from policies aimed at incentivizing investment in human capital accumulation.

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¹³ We conducted several extra robustness exercises using different spatial weight matrices, which are not presented here but are available from the authors upon request. The results concerning the robustness of human capital and income convergence appear robust across spatial weighting matrices.

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Annex

A. Prior Structures

Given a model (say M_j , which corresponds to size k), we can rely on the results in Fernández et al. (2001a) and use a noninformative improper prior on α and σ in (1) and a so-called g-prior (Zellner, 1986) for the coefficient vector:

$$p(\vec{\beta}_k | \alpha, \rho, \sigma) \sim N(\underline{0}_k, g\sigma^2 (X_k' X_k)^{-1}).$$

The prior is noninformative in the sense that the variable is thought of as having no influence on the dependent variable. The prior expected value of β is zero with variance equal to the ordinary least squares variance multiplied by the scalar g . Increasing g decreases the researcher's confidence in the prior guess, whereas a small g corresponds to a strong belief a priori. We use the benchmark prior for g put forward by Fernández et al. (2001a), setting $g = \max\{N, K^2\}$. This benchmark prior over g implies that the relative size of the sample as compared to the number of covariates will determine whether models are compared based on BIC (Bayesian Information Criterion, see Schwarz, 1978) or RIC (Risk Inflation Criterion, see Foster and George, 1994). We follow LeSage and Parent's (2007) proposal and use a beta prior distribution for ρ .

Several approaches to the elicitation of prior information on model size have been proposed by the modern literature on BMA. Many studies rely on a diffuse prior setting which assigns equal probability to all possible models, thereby imposing a mean prior model size of $K/2$. In contrast, some authors give more prior weight to relatively pragmatic models by assuming Bernoulli distributions with fixed parameter π on the inclusion probability for each variable and using the expected model size, πK , to elicit the prior (see Sala-i-Martin et al., 2004). Following Brown et al. (1998), Ley and Steel (2009) propose the use of a Binomial-Beta prior distribution, where a Beta distribution is assumed as a hyperprior on π , the parameter of the Bernoulli distribution for the inclusion of each regressor. The flexibility of the Beta distribution allows for very different prior structures on model size using the Binomial-Beta distribution (see examples in Ley and Steel, 2009).

B. Posterior Distribution SAR Model and MCMC algorithm

The posterior distributions of the β -parameters for the SAR specification are calculated as the β that maximizes the likelihood calculated over a grid of ρ values. The posterior distributions of interest over the model space can be then obtained

using Markov Chain Monte Carlo Model Composition (MC3) methods in a straightforward manner (see LeSage and Parent, 2007). In particular, we use a random-walk step in every replication of the MC3 procedure, constructing an alternative model to the active one in each step of the chain by adding or subtracting a regressor from the active model. The chain then moves to the alternative model with probability given the product of Bayes factor and prior odds resulting from the Beta-Binomial prior distribution. The posterior inference is based on the models visited by the Markov chain instead of the complete (potentially untractable) model space (see Fernández et al. (2001a) for a more detailed description of this strategy). All results were obtained from 1,100,000 draws of the MC3 sampler where we discarded the first 100,000 draws (burn-in phase).

Chart 1

Posterior Inclusion Probability under Different Weight Matrices



Source: Authors' calculations.

Table 1

Estimation Results

	Model 1			Model 2			Model 3		
	PIP	PM	PSD	PIP	PM	PSD	PIP	PM	PSD
AccessAir	0.017	0.000	0.001	0.008	0.000	0.000	0.094	0.001	0.002
AccessRoad	0.301	-0.002	0.003	0.004	0.000	0.000	0.324	-0.001	0.002
AirportDens	0.011	0.036	0.379	0.003	0.003	0.084	0.090	0.299	1.129
Airports	0.043	0.000	0.000	0.006	0.000	0.000	0.287	0.000	0.000
ARH0	0.009	0.000	0.004	0.002	0.000	0.001	0.092	0.003	0.013
ARL0	0.003	0.000	0.001	0.002	0.000	0.001	0.022	0.000	0.003
ART0	0.001	0.000	0.000	0.004	0.000	0.001	0.027	-0.000	0.006
Capital	0.998	0.005	0.003	0.677	0.000	0.002	1.000	0.006	0.003
ConnectAir	0.011	0.000	0.000	0.003	0.000	0.000	0.059	-0.000	0.001
ConnectSea	0.002	0.000	0.000	0.003	0.000	0.000	0.020	0.000	0.000
DistCap	0.009	0.000	0.000	0.002	0.000	0.000	0.036	0.000	0.000
Distde71	0.585	0.000	0.000	0.006	0.000	0.000	0.216	0.000	0.000
EMPDENS0	0.002	0.000	0.000	0.004	0.000	0.000	0.036	0.000	0.001
EREH0	0.006	0.000	0.002	0.002	0.000	0.001	0.042	0.001	0.007
EREL0	0.004	0.000	0.001	0.004	0.000	0.001	0.031	0.000	0.003
ERET0	0.004	0.000	0.001	0.008	0.000	0.002	0.035	0.001	0.006
GDPCAP0	0.389	-0.004	0.006	1.000	-0.030	0.004	0.888	-0.012	0.007
gPOP	0.025	0.007	0.045	0.003	-0.000	0.007	0.315	0.090	0.147
Hazard	0.002	0.000	0.000	0.010	0.000	0.000	0.019	0.000	0.000
HRSTcore	0.003	0.000	0.001	0.003	0.000	0.000	0.023	0.000	0.002
INTF	0.019	0.001	0.004	1.000	0.084	0.013	0.371	0.013	0.019
OUTDENS0	0.003	0.000	0.000	0.005	0.000	0.000	0.022	0.000	0.000
PatentBIO	0.002	0.000	0.007	0.007	0.001	0.013	0.025	0.002	0.024
PatentHT	0.005	0.000	0.004	0.017	0.001	0.006	0.050	0.002	0.011
PatentICT	0.006	0.000	0.002	0.019	0.001	0.004	0.043	0.001	0.007
PatentShBIO	0.001	0.000	0.001	0.002	0.000	0.001	0.019	0.000	0.002
PatentShHT	0.002	0.000	0.000	0.008	0.000	0.001	0.025	0.000	0.001
PatentShICT	0.003	0.000	0.000	0.022	0.000	0.001	0.022	0.000	0.001
PatentT	0.003	0.000	0.001	0.020	0.000	0.002	0.027	0.000	0.002
POPDENS0	0.003	0.000	0.000	0.004	0.000	0.000	0.039	-0.000	0.001
RailDens	0.001	0.000	0.001	0.003	0.000	0.001	0.020	0.000	0.002
RegBorder	0.001	0.000	0.000	0.007	0.000	0.000	0.017	0.000	0.000
RegCoast	0.004	0.000	0.000	0.002	0.000	0.000	0.060	-0.000	0.002
RegObj1	0.006	0.000	0.000	0.004	0.000	0.000	0.052	0.000	0.001
RegPent27	0.005	0.000	0.000	0.003	0.000	0.000	0.043	0.000	0.001
RoadDens	0.003	0.000	0.000	0.003	0.000	0.000	0.029	0.000	0.001
Seaports	0.006	0.000	0.000	0.002	0.000	0.000	0.076	0.000	0.002
Settl	0.002	0.000	0.000	0.003	0.000	0.000	0.016	0.000	0.000
ShAB0	0.005	0.000	0.002	0.014	0.001	0.005	0.036	0.001	0.007
ShCE0	0.003	0.000	0.001	0.003	0.000	0.001	0.024	0.000	0.003
shGFCF	0.006	0.000	0.001	0.040	0.001	0.004	0.125	0.002	0.007
ShLLL	0.003	0.000	0.001	0.005	0.000	0.003	0.028	0.000	0.003
ShSH	0.996	0.053	0.010	0.612	0.030	0.026	0.951	0.044	0.016
ShSL	0.003	0.000	0.001	0.362	-0.012	0.017	0.025	-0.000	0.001
TELF	0.085	-0.000	0.001	0.003	0.000	0.000	0.243	-0.000	0.001
TELH	0.003	0.000	0.000	0.003	0.000	0.000	0.021	0.000	0.000
Temp	0.002	0.000	0.000	0.003	0.000	0.000	0.021	0.000	0.000
URH0	0.003	0.000	0.001	0.005	0.000	0.002	0.043	0.001	0.010
URL0	0.012	-0.000	0.002	0.023	-0.000	0.003	0.182	-0.004	0.010
URT0	0.009	-0.000	0.002	0.008	-0.000	0.002	0.081	-0.002	0.010
CEEDummy	1.000	0.016	0.006	1.000	0.000	0.001	1.000	0.008	0.008
CEEDummy.x.AccessRoad	0.005	-0.000	0.001	0.000	0.000	0.000	0.009	0.000	0.001
CEEDummy.x.Capital	0.993	0.018	0.004	0.676	0.022	0.015	1.000	0.021	0.004
CEEDummy.x.EMPDENS0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
CEEDummy.x.GDPCAP0	0.001	0.000	0.000	0.011	0.000	0.002	0.020	0.000	0.001
CEEDummy.x.gPOP	0.000	0.000	0.002	0.000	0.000	0.003	0.005	0.000	0.025
CEEDummy.x.OUTDENS0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
CEEDummy.x.POPDENS0	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000
CEEDummy.x.shGFCF	0.000	0.000	0.000	0.005	0.000	0.005	0.019	0.001	0.006
CEEDummy.x.ShSH	0.005	0.000	0.005	0.324	0.096	0.141	0.027	-0.001	0.008
Spatial Rho	-	-	-	-	-	-	-	0.623	-

Source: Authors' calculations.

Note: PIP stands for Posterior Inclusion Probability, PM stands for Posterior Mean and PSD stands for Posterior Standard Deviation. All calculations based on MC3 sampling with 1,000,000 replications (after 100,000 burn-in draws).

PIPs over 10% in bold. Variables separated by .x. denote interaction terms.

Model 1: Cross-section of regions (no country-fixed effects); model 2: country-fixed effects; model 3: spatial autoregressive model (no country fixed effects).

Table 2

Data Description

Variable name	Description	Source
Dependent variable		
gGDPCAP	Growth rate of real GDP per capita	Eurostat
Factor accumulation/convergence		
GDPCAP0	Initial real GDP per capita (in logs)	Eurostat
gPOP	Growth rate of population	Eurostat
shGFCF	Share of GFCF in GVA	Cambridge Econometrics
Infrastructure		
INTF	Proportion of firms with own website	ESPON
TELH	A typology of levels of household telecommunications uptake	ESPON
TELF	A typology of estimated levels of business telecommunications access and uptake	ESPON
Seaports	Regions with seaports	ESPON
AirportDens	Airport density	ESPON
RoadDens	Road density	ESPON
RailDens	Rail density	ESPON
ConnectAir	Connectivity to commercial airports by car	ESPON
ConnectSea	Connectivity to commercial seaports by car	ESPON
AccessAir	Potential accessibility air	ESPON
AccessRail	Potential accessibility rail	ESPON
AccessRoad	Potential accessibility road	ESPON
Socio-geographical variables		
Settl	Settlement structure	ESPON
OUTDENS0	Initial output density	
EMPDENS0	Initial employment density	
POPDENS0	Initial population density	
RegCoast	Coast	ESPON
RegBorder	Border	ESPON
RegPent27	Pentagon EU-27 plus 2	ESPON
RegObj1	Objective 1 regions	ESPON
Capital	Capital city	
Airports	Number of airports	ESPON
Temp	Extreme temperatures	ESPON
Hazard	Sum of all weighted hazard values	ESPON
Distde71	Distance to Frankfurt	
DistCap	Distance to capital city	
Technological innovation		
PatentT	Number of patents total	Eurostat
PatentHT	Number of patents in high technology	Eurostat
PatentICT	Number of patents in ICT	Eurostat
PatentBIO	Number of patents in biotechnology	Eurostat
PatentShHT	Share of patents in high technology	Eurostat
PatentShICT	Share of patents in ICT	Eurostat
PatentShBIO	Share of patents in biotechnology	Eurostat
HRSTcore	Human resources in science and technology (core)	Eurostat LFS
Human capital		
ShSH	Share of highly educated in working-age population	Eurostat LFS
ShSM*	Share of medium educated in working-age population	Eurostat LFS
ShSL	Share of low educated in working-age population	Eurostat LFS
ShLLL	Lifelong learning	Eurostat LFS
Sectoral structure/employment		
ShAB0	Initial share of NACE A and B (Agriculture)	Eurostat
ShCE0	Initial share of NACE C to E (Mining, Manufacturing and Energy)	Eurostat
ShJK0	Initial share of NACE J to K (Business services)	Eurostat
EREH0	Employment rate – high	Eurostat LFS
EREM0*	Employment rate – medium	Eurostat LFS
EREL0	Employment rate – low	Eurostat LFS
ERET0	Employment rate – total	Eurostat LFS
URH0	Unemployment rate – high	Eurostat LFS
URM0*	Unemployment rate – medium	Eurostat LFS
URL0	Unemployment rate – low	Eurostat LFS
URTO	Unemployment rate – total	Eurostat LFS
ARH0	Activity rate high	Eurostat LFS
ARM0*	Activity rate medium	Eurostat LFS
ARL0	Activity rate low	Eurostat LFS
ART0	Activity rate total	Eurostat LFS

Source: Authors' compilation.

Note: Data are from ESPON (European Spatial Planning Observation Network, www.espon.eu), Eurostat and Eurostat LFS (Eurostat Labour Force Survey, <http://lepp.eurostat.ec.europa.eu/>). Variables expressed in shares additionally denoted by asterisk (*) are not included in the regressions and serve hence as a reference group.

Macrofinancial Developments and Systemic Change in CIS Central Asia

Stephan Barisitz¹

In CIS Central Asia, the institutional economic framework is found to be remarkably heterogeneous across the region: Kazakhstan and the Kyrgyz Republic are market-oriented reforming economies, Tajikistan and Uzbekistan can be characterized as hybrid economies, while Turkmenistan remains largely centrally-planned. All CIS Central Asian countries – except for Turkmenistan – have introduced current account convertibility, if obstructed by trade restrictions in the Uzbek case. Kazakhstan liberalized its capital account in early 2007. Energy and other export proceeds, remittance inflows, FDI and other capital inflows and credit booms have contributed to the region's strong economic expansion, at least up to 2007. In this period, Central Asia has pragmatically coped with the potentially conflicting dual goals of combating inflation while preventing too strong currency appreciation (to support competitiveness). The global inflationary spike and the world financial crisis substituted a new policy dilemma for the old one: whether to give priority to fighting inflation or to bailing out credit institutions. With its relatively large banking sector, Kazakhstan was the only country really struck by this dilemma. The Kazakh authorities heavily intervened and partially nationalized the sector, which has, however, not prevented nationalized banks from defaulting. At the other extreme, the Turkmen and Uzbek financial sectors have remained insulated from international financial contagion, albeit at high costs in terms of economic development and income.

JEL classification: E52, E63, G21, G28, P34

Keywords: Banking, financial stability, monetary policy, exchange rate regime, Central Asia, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan

1 Introduction

The purpose of this paper is to provide a concise analytical overview of the institutional and economic policy frameworks as well as the macroeconomic policies and challenges in the five countries of CIS Central Asia (Kazakhstan, Kyrgyzstan,² Tajikistan, Turkmenistan and Uzbekistan) in a comparative manner. Special emphasis will be laid on monetary and exchange rate policies and on banking sector and financial stability developments. References will also be made to the positions of Austrian banks, where they are present. The study is not aimed at testing a particular hypothesis, but at presenting, analyzing and interpreting information on a specific region, from which stylized facts and policy assessments can be drawn as conclusions (empirical induction). To the best of the author's knowledge, there is no other study that focuses on surveying and evaluating Central Asian countries' monetary, exchange rate and banking policies as well as policy frameworks in a comparative and up-to-date way.³

The study starts with a horizontal flyover of the region (section 2), comparing the evolution of macroeconomic, institutional, structural as well as banking and financial indicators across the five countries since the early years of the new millennium. This is followed by country-by-country policy close-ups (section 3),

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² The terms "Kyrgyzstan" and "Kyrgyz Republic" will here be used as synonyms.

³ The author plans to publish a follow-up study with a focus on the financial sector of Kazakhstan, the largest economy of the region.

giving country-specific information on policy conditions and essential details with respect to monetary policy and banking supervision experiences and reforms. Section 4 briefly describes the activities of Austrian banks in the region. An overall comparative assessment (section 5) summarizes analyzed facts and draws conclusions on the success and challenges of Central Asian monetary and banking sector policies, while taking into account the diverse repercussions and implications of the current global financial and economic crisis.

2 Macro-Structural Overview of Central Asia: Impressive Heterogeneity

Occupying a territory approximately the size of the current EU, the five countries of CIS Central Asia (i.e. the former Soviet Central Asian republics) together boast about 60 million inhabitants. While oil and mineral-rich Kazakhstan comprises over two-thirds of Central Asian territory and GDP, Uzbekistan accounts for almost half of the regional population. Extraordinary natural resource wealth and reform-oriented economic policies have lifted Kazakhstan's GDP per capita to EUR 5,800 (exchange rate-based) in 2008, which is way above the respective levels of the other countries of the region. Gas-rich but isolationist Turkmenistan is number two (EUR 1,850 in 2007). Interventionist Uzbekistan (an exporter of cotton, energy and metals)⁴ as well as mountainous and remote Kyrgyzstan (exporter of metals, minerals and food) and Tajikistan (aluminum exports) feature GDP per capita levels of around EUR 600, which are the lowest of the region and the CIS.

While coming from modest points of departure, average annual economic growth in the nine years from 2000 to 2008 is impressively high in all countries, except perhaps in Kyrgyzstan, which experienced bouts of stagnation in 2002 and 2005 (chart 1). Why has growth been strong? For one, Central Asia has benefited from economic recovery after the partly deep transition depression of the 1990s, which had lasted particularly long in the region, and also after the Russian crisis of 1998. Secondly, since all of these countries are resource exporters, resource – particularly energy – price rises in recent years have boosted growth. Thirdly, in most countries, remittances and/or inflows of capital have also played a role recently.

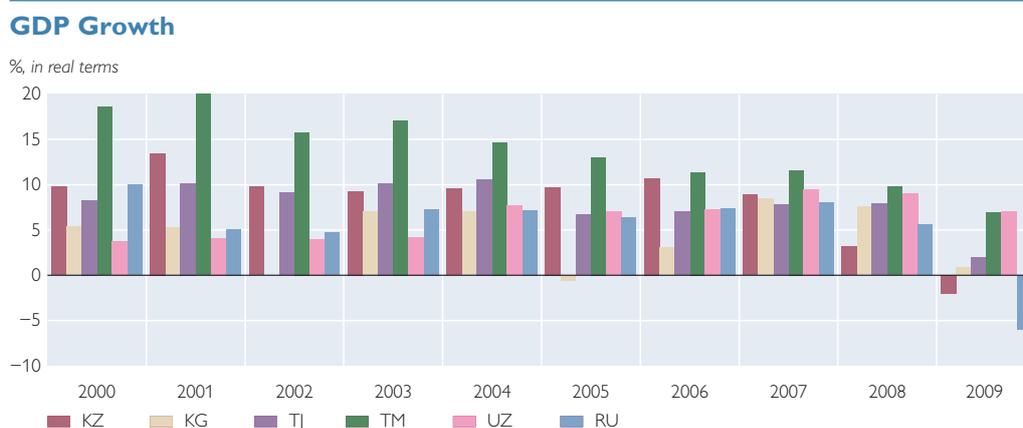
Given that Russia has been a main trading partner, a major source of remittances, an important focus of financial linkages and key competitor of the region, Russia's buoyant economic development until the fall of 2008 and its slump afterwards left their marks in Central Asia (Jardaneh, 2009; see also chart 1 and table 6 as well as tables 4 and 5 in the annex). In late 2008, under the impact of the global crisis, growth declined substantially in Kazakhstan, the Kyrgyz Republic and Tajikistan. It appears that in 2009, Turkmenistan and Uzbekistan, which both constitute highly centralized, state-controlled and relatively secluded economies, are also being affected, if to a more limited degree.

Major regional energy exporters – Kazakhstan, Turkmenistan and Uzbekistan – have chalked up large trade surpluses in recent years, while energy importers – the Kyrgyz Republic and Tajikistan – are saddled with large trade deficits. However,

⁴ Given the high degree of state interventionism in the Turkmen and Uzbek economies, official statistical data on income, GDP and other economic categories have to be treated with caution.

the latter countries have received sizable inflows of workers' remittances. Net inflows of foreign direct investment are substantial in Kazakhstan, smaller in Turkmenistan (though, apparently, catching up), Kyrgyzstan and Tajikistan, and minor in Uzbekistan. Net FDI inflows have dominated capital and financial accounts, except in 2006 and 2007, when portfolio inflows and cross-border loans temporarily expanded strongly in some countries. In 2000–2008, Central Asian annual inflation rates were on an average level of 8% to 15%: Inflation came down from previous instability in the early years of the decade, reached something like a trough in 2003 and 2004, then climbed again and witnessed a spike in 2007, before easing in 2008. This spike was largely due to the global energy and food price explosion. With most of their own currencies hardly older than 15 years, Central Asian economies continue to witness high levels of dollarization.

Chart 1



Source: National statistics, IMF, EBRD.

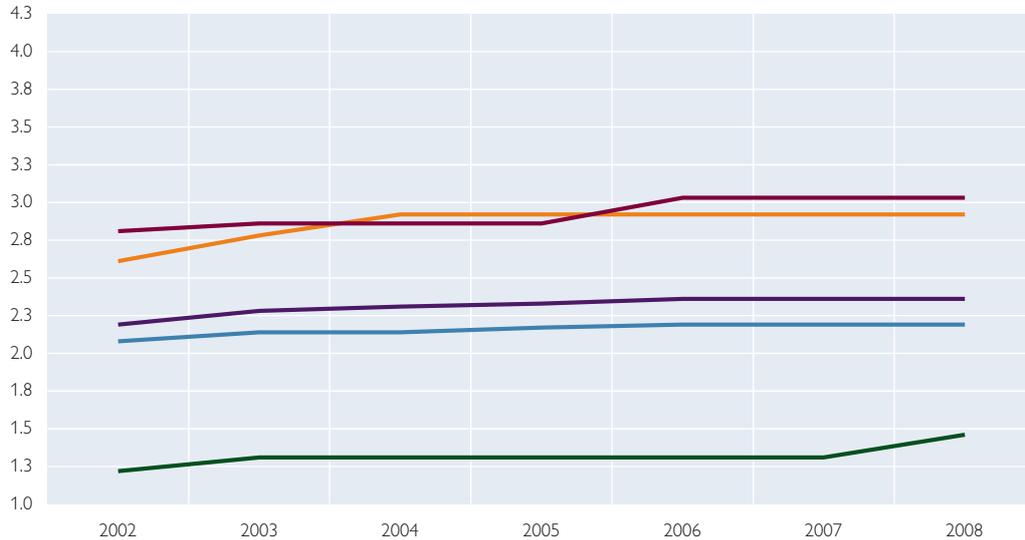
Note: Data for 2009 are forecasts of the IMF World Economic Outlook April 2009.

Looking at comparative structural reform indicators as measured by the EBRD (EBRD, 2008, pp. 4–5) shown in charts 2 to 4, it appears obvious that most of Central Asia still has a considerable reform path to go. Judging from average transition scores, even the most advanced countries – Kazakhstan and the Kyrgyz Republic – are still in the midst of institutional adjustment. At the other end, Turkmenistan essentially remains a centrally-planned economy. Uzbekistan and Tajikistan can be regarded as hybrid economies in that they continue to incorporate important nonmarket components in their economic systems. The ownership structure of Central Asian banking sectors is quite varied. Only in the Kyrgyz Republic does this structure resemble that of a typical Central or Southeastern European country dominated by foreign strategic investors. In Kyrgyzstan, Kazakh credit institutions overwhelmingly prevail among foreign investors, who in 2007 accounted for 59% of all domestic banking assets. In Kazakhstan and Tajikistan, domestic private banking groups dominate the sector, while in the Turkmen and Uzbek sectors, state-owned banks hold sway.

Chart 2

Average Transition Scores (according to EBRD Assessment)

Industrialized market economy



Centrally-planned economy

— KZ — KG — TJ — TM — UZ

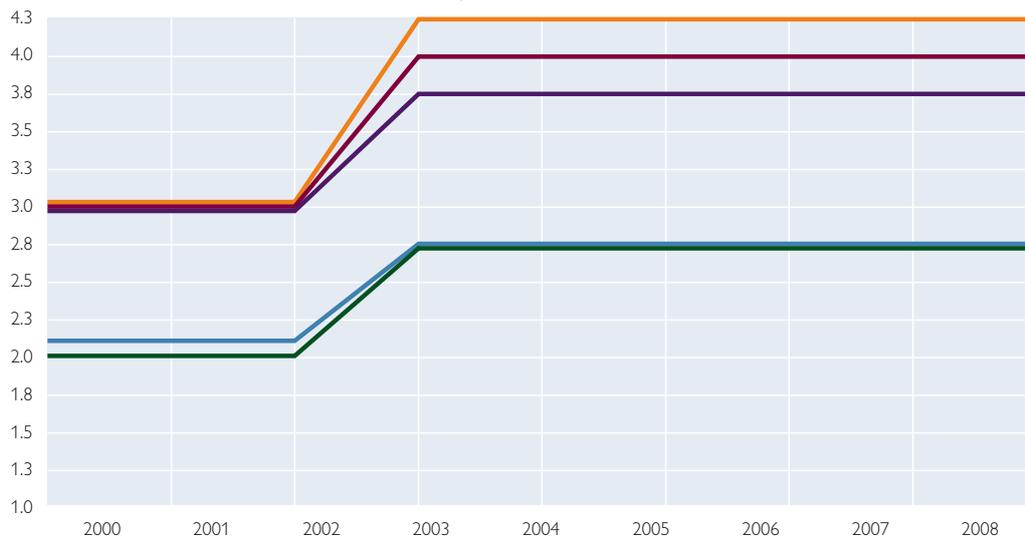
Source: EBRD.

Note: Data for 2008 are preliminary data or estimates.

Chart 3

Price Liberalization

Complete price liberalization with no price control outside housing, transportation and natural monopolies



Most prices under formal control of the authorities

— KG — TJ — TM — UZ — KZ

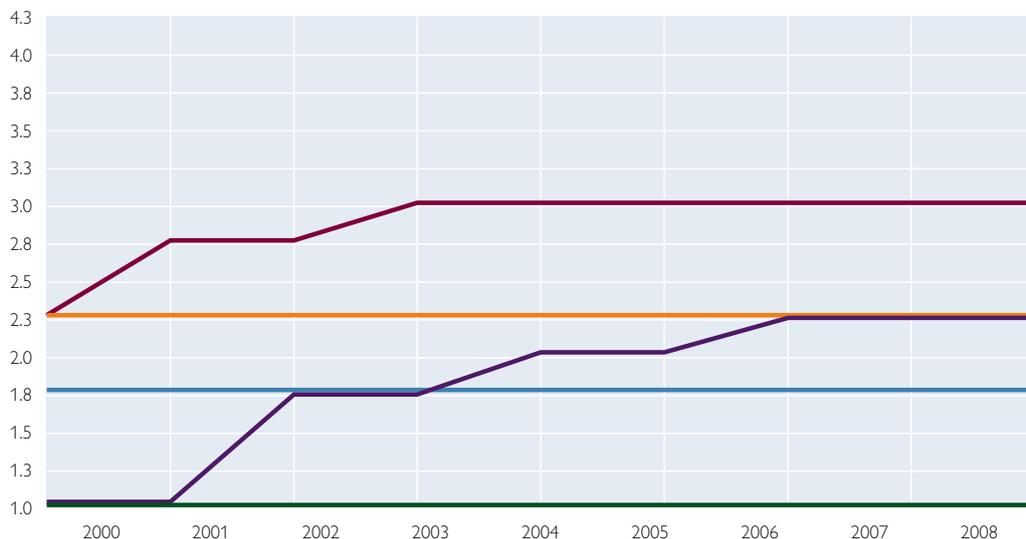
Source: EBRD.

Note: Data for 2008 are preliminary data or estimates.

Chart 4

Banking Reform and Interest Rate Liberalization

Full convergence of banking laws and regulations with BIS standards, provision of full set of competitive services



Little progress beyond establishment of a two-tier system

— KG — TJ — TM — UZ — KZ

Source: EBRD.

Note: Data for 2008 are preliminary data or estimates.

3 Monetary and Banking Policy Country Close-Ups

3.1 Kazakhstan

3.1.1 Policy Environment

Being by far the largest Central Asian economy and the major FDI recipient of the region, Kazakhstan will be dealt with in somewhat more detail. Kazakhstan achieved current account convertibility in 1996 (with its acceptance of Article VIII of the IMF Articles of Agreement) and completely eliminated capital and financial account restrictions in January 2007. As shown in table 1, the country saw impressive growth, which even surpassed 10% in 2006, but sharply decelerated to 3.2% in 2008 under the impact of the global crisis. The driving forces of past growth were strong inflows of export proceeds (oil, gas, metals; see table 3 in the annex) and of capital (FDI, portfolio investments, loans) and the swift expansion of domestic demand.⁵ One of the most spectacular credit booms of all transition countries accompanied strong real growth.⁶

In the process of aggressive expansion, Kazakh banks became very reliant on capital inflows, which, in turn, fueled the domestic credit boom. External liabilities rose to about half of the banking sector’s aggregate balance sheet in mid-2007,

⁵ Data on demand components of GDP in the region are only available for Kazakhstan and Kyrgyzstan (see table 1 in the annex).

⁶ Total bank loans (in EUR) are reported to have increased more than fivefold over just three years (end-2003 to end-2006) in Kazakhstan. In this period, retail loans expanded more than ten times, with triple-digit growth rates each year (Raiffeisen Research, 2008, p. 54).

thus even exceeding the amount of deposits.⁷ Important acquisitions by foreign strategic investors (UniCredit Bank Austria in June 2007 purchased a 92% stake in ATF Bank, the fifth-largest domestic credit institution, for EUR 1.6 billion; Kookmin Bank, a South Korean outfit, in March 2008 acquired a 30% share in TsentrKredit, the sixth-largest domestic bank, for EUR 400 million; Alnair Capital, an Abu Dhabi-based private equity firm, adjusted its stake in Kazkommertsbank, the number one Kazakh bank)⁸ raised the share of foreign-owned credit institutions in total assets to about 15% at end-September 2008. The lion's share of the banking sector has remained in domestic private ownership. Most debt-creating capital inflows consisted of credits taken up in international markets and of Euro-bond issues, and not of loans and funds granted by parent banks (IMF, 2009a, p. 26).

Thus, Kazakhstan was hit particularly hard by the U.S. and global liquidity squeeze since the late summer of 2007. The drying up of capital inflows terminated the credit boom. With lending stagnating (in real terms) from September 2007 and then contracting throughout 2008 and early 2009, the credit crunch had incisive repercussions for the rest of the economy. Moreover, capital outflows put an end to the persistent appreciation pressure on the tenge. About EUR 2.8 billion worth of nonresidents' assets were withdrawn from August to December 2007.

However, oil and commodity prices did not flag for some time; on the contrary, regardless of the weakening global economy in the wake of the subprime crisis, speculative pressures reportedly contributed to skyrocketing international (and hence also Kazakh) energy, food and other commodity prices in the first half of 2008. Bad local harvests also played a role. Largely supply side-driven, Kazakh inflation more than doubled from August to December 2007 and spiked at above 20% in August 2008 (year on year). The mix of declining domestic and external demand and further strongly improving terms of trade produced a measured slowdown of GDP growth in 2007 (to 8.9%) and the first months of 2008. This slowdown accelerated once the aggravation of the financial crisis in September 2008 sent energy and metal prices tumbling.

Given the curtailment of foreign refinancing, reinforced by the severe deterioration of the global economy in the fall of 2008, Kazakh banks could no longer roll over most of their external debt and had to find funds to service sizable maturing liabilities in order to stave off insolvency. Kazakh banks' had strongly engaged themselves in lending to the construction, real estate and retailing sectors, with 40% of bank credit secured by real estate. These sectors were among the hardest hit by the crisis, which reflected rapidly worsening loan quality, once the Kazakh housing bubble had burst.⁹ Given the high level of dollarization (above 40% of credits in 2007), banks incurred considerable exchange rate risks (indirect credit risks) from foreign currency lending to often unhedged and soon distressed borrowers, notably households.

⁷ Total Kazakh external liabilities have expanded to very high levels (over 85% of GDP in 2006–2008). They have consisted overwhelmingly of private debt, about half of which was bank debt in 2007.

⁸ The largest foreign commitment is that of UniCredit Bank Austria: At mid-2008, ATF Bank (purchased by UniCredit Bank Austria in mid-2007) held a market share of 8% of total assets. Austria's Raiffeisenbank planned to establish a greenfield subsidiary in Kazakhstan, but this plan was suspended because of the deterioration of the global economic situation (see also section 4).

⁹ The oil sector has not been primarily reliant on domestic banks for its financing.

Table 1

Kazakhstan: Key Macroeconomic and Financial Sector Indicators

	2000	2002	2004	2005	2006	2007	2008
GDP growth (in real terms, %)	9.8	9.8	9.6	9.7	10.7	8.9	3.3
Current account balance (% of GDP)	2.0	-4.2	0.8	-1.9	-2.4	-7.8	5.1
Net FDI flows (% of GDP)	7.0	8.9	12.6	3.1	7.3	6.6	4.1
Gross external debt (% of GDP)	69.3	74.1	75.8	79.9	87.8	86.0	85.5
Gross reserves excl. gold (% of GDP) ¹	8.7	10.5	19.6	12.7	22.9	16.7	14.9
General government budget balance (% of GDP)	-1.0	1.0	2.5	5.8	7.5	-1.7	-2.1
CPI inflation (year-end, %)	9.8	6.6	6.7	7.5	8.4	18.8	9.5
Exchange rate: KZT/ USD (annual average)	142.1	153.3	136.0	132.9	126.1	122.6	120.3
Level of monetization (M2/GDP, %)	15.3	19.2	27.8	27.2	36.0	36.4	38.8 ²
Credit to the private sector (% of GDP)	10.6	18.6	26.5	35.7	47.8	58.9	48.9
of which: foreign currency-denominated (%)	..	68.3	49.4	49.3	46.9	40.9	52.1
of which: nonperforming (%)	2.1	4.1	4.2	3.3	2.4	2.7	..
Asset share of foreign-owned banks (%)	19.8	34.3	32.4	7.3	5.9	15.8	14.8 ²
Capital adequacy ratio (%)	25.7	17.2	15.3	14.9	14.8	14.2	14.9
Stock market capitalization (% of GDP)	7.5	5.5	8.7	18.6	54.3	39.2	..

Source: National statistics, IMF, EBRD, wiw.

¹ Do not include financial assets of NFRK (oil stabilization fund).

² End-September.

Note: Figures for 2008 are preliminary data.

3.1.2 Policy Practice

Back in the years of seemingly relentless economic expansion, the authorities may have found themselves locked into a policy aimed at potentially conflicting dual goals. On the one hand, price stability was pursued through reserve money growth targeting and important fiscal sterilization activities.¹⁰ On the other hand, against the background of large inflows of resource export proceeds, too strong an appreciation of the domestic currency was to be prevented in order to secure the competitiveness of the non-resource tradable sector through foreign exchange interventions (purchases) (possible Dutch disease problem, similarities to situation in Russia; see also Égert and Leonard, 2008).

Once confronted with the global liquidity squeeze and runaway inflation of late 2007 and early 2008 – a new policy dilemma – the government and the National Bank of Kazakhstan (NBK) opted for protecting the banking sector first, while intermittently intervening in favor of price stability. In the fall of 2007, the NBK injected about EUR 4 billion (around a quarter of its foreign currency reserves) to support the heavily leveraged banking sector as well as the tenge. This included the relaxation of reserve requirement rules, stepped-up refinancing operations for banks and large-scale repurchases of NBK notes (open market policy). In order to reassure the population and market participants, the Kazakh currency was de facto pegged to the U.S. dollar in October 2007 (IMF, 2008a, p. 6).

Once the acute threat to the stability of the banking sector appeared to have been staved off, the NBK sharply adjusted the refinancing rate (by 2 percentage points in December 2007) to check inflation. Thanks to very high oil prices up to the summer of 2008, the authorities managed to replenish foreign exchange re-

¹⁰ These latter measures were carried out by delivering budget surpluses and building up assets in the National Fund of the Republic of Kazakhstan (NFRK), the country's oil stabilization fund, established in 2001.

serves above the level they had prior to the crisis. As of September 2008, the country's total foreign currency assets (official reserves plus the oil stabilization fund) exceeded EUR 33 billion (about 40% of GDP). Banking regulation and supervision have been tightened and are certainly among the most advanced in the CIS, but there is still a need to move further on the path from compliance-oriented to risk-based accounting and supervision.

The “second wave” of the U.S. and global financial crisis and the ensuing global recession destabilized the situation of the Kazakh financial sector anew, and this time more profoundly. To face the repercussions of the substantial weakening of the terms of trade, the sharp deceleration of growth, the worsening of credit quality (in particular after the Kazakh housing bubble had burst), the mortgage crisis and banks' sizable debt repayment obligations in 2009, the authorities in November 2008 announced the creation of a distressed assets fund (a new fund comprising a planned amount of about EUR 4.5 billion) and amended Kazakhstan's legislation to enable the state to buy stakes in the country's largest credit institutions.

In particular, the National Fund of the Republic of Kazakhstan (NFRK) agreed to place EUR 2.7 billion into the capital of the country's four largest banks. The latter together account for about two-thirds of banking sector assets, none of the four are foreign owned. In February 2009, the state thus acquired an equity stake of about 75% in Bank Turan Alem (BTA), the largest bank, and agreed to acquire a comparable stake in Alliance Bank, the fourth-largest credit institution. The state took minority stakes in the other two credit institutions. The Kazakh public development agency Samruk Kazyna (set up in October 2008) is holding the state's shares. The authorities have pointed out that the nationalizations are intended to be only temporary measures to help redress the situation. The authorities further plan to spend about EUR 9 billion (around 10% of GDP) in 2009–2010 as part of their economic stabilization program. Meanwhile, lower commodity prices and slower economic and credit growth contributed to a remarkable dip in inflation, to 8.8% year on year in April 2009 (see also table 1).

Worsening external balances, the strong depreciation of the Russian ruble in late 2008 and early 2009 and mounting losses of currency reserves¹¹ in defending the tenge exchange rate against the U.S. dollar eventually prompted the NBK to devalue the national currency by 20% in one stroke in early February 2009 (Pindyuk, 2009, p. 104). The monetary authority intends to keep the new rate stable. While reducing pressures on the tenge, the sharp devaluation has made it more expensive for banks to service their relatively large foreign currency liabilities and it has increased credit risk related to unhedged debtors. Therefore, although the refinancing rate was simultaneously cut back to 9.5% to stimulate lending, pressures for further state intervention grew. Meanwhile, it turned out that BTA's financial needs were higher than originally assessed. In April 2009, President Nazarbayev instructed the government to devise a plan to help restructure major banks' foreign debt. In late April, BTA defaulted on a EUR 420 million loan, which is understood to be triggering payments on credit default swap (CDS) contracts written on the bank – the first such event in the CIS region since the

¹¹ *Gross international reserves of the NBK shrank by almost a fifth in the five months to end-January 2009.*

start of the world financial crisis (Neue Zürcher Zeitung, 2009).¹² Depending on the further unfolding of the world economic crisis, Kazakhstan will likely experience recession in 2009 (see forecast in chart 1).¹³

3.2 Kyrgyz Republic

The Kyrgyz Republic has been WTO member since 1998 and achieved current account convertibility already in 1995. While the country is the second-poorest of Central Asia and the CIS (in terms of per capita GDP), it has witnessed strong, but volatile economic growth in recent years. Driving forces have included demand for and prices of the country's export staples (gold, electricity). At the same time, Kyrgyzstan is an importer of oil and gas. Inflows of workers' remittances (20% to 25% of GDP, some 90% of which coming from Russia and Kazakhstan) have also contributed substantially to growth. Finally, a modest credit boom supported by a fledgling banking sector, nearly half of which is Kazakh-owned, accompanied growth recently. In 2006, the current account balance turned negative again and strongly deteriorated in 2008. This change was largely triggered by expanding domestic demand, weakening external demand and worsening terms of trade (see below). Increasing capital inflows (FDI, portfolio capital and loans) bridged the gap. Given the robust inflows of remittances and capital, up to 2007 strong remonetization and nominal appreciation pressures on the Kyrgyz som prevailed.

Starting in the second half of 2007, the country was struck by painful external shocks. It suffered from a mostly supply side-driven sharp increase of CPI inflation (skyrocketing fuel and food import prices), which jumped from 5% at end-2006 to 20% at end-2007 and peaked at 32% in July 2008, before declining again to 20% at the end of that year (table 2). In late 2007, the global liquidity squeeze prompted foreign-owned – mostly Kazakh – banks to recall credit lines to their subsidiaries in Kyrgyzstan to shore up liquidity at home, which put an end to the credit boom; in late 2008, loan growth ground to a halt. However, the Kyrgyz banking system has so far weathered the spillover effects from the crisis in Kazakhstan relatively well, due to its high capitalization and liquidity. Still, deteriorating credit quality is bound to exert new pressures. The population's trust in banks may drop in 2009. The substantial weakening of economic expansion in Russia and Kazakhstan in 2008 affected exports¹⁴ and is going to undermine remittance flows: Many guest workers in Russia and Kazakhstan are no longer needed in 2009 and are being sent home (Libération, 2008). In September 2008, nominal appreciation pressures on the som evaporated and the Kyrgyz currency depreciated about 15% until end-March 2009. The country's GDP growth descended from above 8% in 2007 to about 7.6% in 2008 and is expected to drop sharply in 2009.

Looking at policy conduct, in the benign economic situation up to 2007 the National Bank of the Kyrgyz Republic (NBKR) had successfully checked inflation through monetary targeting and had resisted som appreciation pressures by –

¹² Bank Turan-Alem's total foreign liabilities are reported to stand at almost EUR 10 billion (near 15% of the country's entire external debt). The authorities have declared that they do not intend to guarantee the loans of (nationalized) BTA or of any other bank. BTA has entered negotiations to sell a majority stake to Sberbank (Russia), as pointed out by NBK Governor Marchenko at the EBRD Annual Conference in mid-May 2009.

¹³ According to preliminary figures, GDP shrank by 2.2% in the first quarter of 2009 (year on year).

¹⁴ These two neighbors accounted for 40% of the Kyrgyz Republic's exports in 2007.

partly sterilized – foreign currency market interventions. However, high dollarization (share of foreign currency-denominated deposits: about two-thirds) rendered monetary policy challenging. Budgetary policies were gradually tightened. The authorities' reaction to the sharp increase of inflation in the fall of 2007 and its persistence in 2008 included monetary tightening (substantial increase of interest rates, expansion of open market transactions with T-bills and NBKR bills, curtailment of foreign exchange interventions) and further tightening of fiscal policies (build-up of government deposits at the NBKR).

The deepening of the global financial and economic crisis since September 2008, the decline of staples prices, the slowdown in domestic demand and the authorities' policy actions have further reined in inflation, which fell to 16.7% in February 2009 (year on year). Contingency plans for supplying liquidity and capital to “strategic banks” have been drawn up: The authorities have established a fund of EUR 75 million to refinance credit institutions, if necessary. First refinancing measures may be taken in mid-2009. The impact of the crisis may also be cushioned by a sizable financial support package, including concessional budgetary assistance offered in early 2009 by the Russian Federation (IMF, 2009b).

Table 2

Kyrgyz Republic: Key Macroeconomic and Financial Sector Indicators

	2000	2002	2004	2005	2006	2007	2008
GDP growth (in real terms, %)	5.4	0.0	7.0	-0.6	3.1	8.5	7.6
Current account balance (% of GDP)	-5.7	-4.0	5.0	2.8	-3.1	-0.2	-6.5
Net FDI flows (% of GDP)	-0.5	0.3	6.0	1.8	6.5	7.2	4.7
Gross external debt (% of GDP)	124.4	111.1	95.1	85.5	77.9	61.2	45.8
Gross reserves excl. gold (% of GDP)	15.0	18.1	25.1	24.7	28.7	31.8	24.2
General government budget balance (% of GDP)	-11.4	-5.3	-4.4	-3.4	-2.5	-0.7	-1.3
CPI inflation (year-end, %)	9.5	2.3	2.8	4.9	5.1	20.1	19.8
Exchange rate: KGS/USD (annual average)	47.7	46.9	42.7	41.0	40.2	37.3	36.6
Level of monetization (M2/GDP, %)	11.3	14.6	20.6	21.2	28.4	31.2	..
Credit to the private sector (% of GDP)	4.2	4.2	7.1	8.0	10.5	15.9	18.7
of which: foreign currency-denominated (%)	69.0	57.1	70.4	71.3	69.5	62.2	64.7
of which: nonperforming (%)	13.4	13.3	6.4	8.2	6.2	3.5	5.3
Asset share of foreign-owned banks (%)	24.6	50.4	70.1	73.6	71.5	58.7	..
Capital adequacy ratio (%)	..	36.4	23.0	26.5	28.5	31.0	32.5
Stock market capitalization (% of GDP)	0.3	0.5	1.5	1.7	3.1	3.1	..

Source: National statistics, IMF, EBRD.

Note: Figures for 2008 are preliminary data.

3.3 Tajikistan

Tajikistan achieved current account convertibility in 2004. The landlocked mountainous country bordering Afghanistan emerged from a civil war in the late 1990s and remains the poorest of Central Asia and the CIS (it featured per capita GDP of about EUR 520 in 2008). However, thanks to impressive and sustained economic expansion, Tajikistan has been catching up with some of its neighbors. As table 3 indicates, growth remained robust also in 2007 (7.8%) and 2008 (7.9%). The driving forces have been sharply expanding private transfers from Russia and Kazakhstan: Guest workers' remittances increased to almost a third of Tajik GDP in 2006 and to about 45% in 2008. Rising, if volatile, prices for the country's

export staples aluminum, cotton and electricity (table 3 in the annex) contributed to growth, while Tajikistan remains a net energy importer.

In 2006–2008, bad harvests in the region as well as global energy and food price hikes (external shocks) contributed to pushing Tajik CPI inflation from single to double digits (19.7% in December 2007). Saddled with institutional and structural weaknesses, including serious shortcomings in corporate governance, banking legislation, regulation, supervision and enforcement, the country's financial sector remains at a modest level of development and possesses only limited linkages to international financial markets.¹⁵ The interbank market is virtually nonexistent. That said, loan growth accelerated in 2007 and the credit-to-GDP ratio almost doubled from end-2006 to end-2008 (table 3), buoyed by the surge of remittance inflows as well as by rising nonresident deposits. The sudden credit expansion could have led to the accumulation of unrecognized credit risk. At least up to mid-2008, the Tajik somoni had been under appreciation pressure (due to rising inflows of remittances). However, the deepening of the global economic crisis in late 2008 appears to have finally affected Tajikistan in that commodity prices have receded, exports have declined while import demand has still been strong, the inflow of remittances has been leveling off and credit growth has come down again.

Looking at policy conduct, in recent years the National Bank of Tajikistan (NBT) aimed at combating inflation through reserve money growth targeting, including changing banks' reserve requirements. In order to support the export sector, somoni appreciation was checked through foreign currency interventions, largely unsterilized for lack of instruments. The NBT therefore faced a policy dilemma of potentially conflicting goals of price stability versus industrial competitiveness, not unlike the challenges encountered by the NBK up to 2007. In such an environment, prudent fiscal policy is central to the overall macropolicy effort: The budget balance, excluding externally financed public investment programs, has been kept near zero or slightly positive in recent years. Government deposits have been built up at the NBT. As a result of the monetary authority's repeated interventions, the somoni has slightly but almost continuously depreciated (in nominal terms) against the U.S. dollar, the euro and the Russian ruble. Another element of the rudimentary policy framework still attached to administrative centralism is the traditional practice of allocating directed NBT credits to the cotton sector, which persisted at least until 2008 and contributed to the intermittent loosening of the monetary stance.¹⁶

Inflation receded from its August 2008 peak of over 25% (year on year) to 9.4% in April 2009, helped by the recent retrenchment in international fuel and food prices. In 2009, spillover effects from the world economic crisis are expected to sharply dampen annual growth and worsen Tajikistan's external position by cutting into remittance flows (already down by one-fifth in January 2009 year on year). Credit quality may swiftly deteriorate. In anticipation of likely difficulties

¹⁵ After the monetary authority had opened up the banking sector to foreign presence in 2007, one foreign-owned bank – Kazkommertsbank Tadjikistana (from Kazakhstan) – took up operations in early 2008, and its capital constitutes around one-fifth of total sector capital.

¹⁶ An episode of misreporting of foreign exchange reserves to the IMF was followed by a special audit of the NBT in accordance with a Staff-Monitored Program in the second half of 2008. According to the IMF, the Tajik monetary authority's autonomy and governance require ambitious strengthening (IMF, 2008b, p. 11).

and hardships coming, the Tajik Finance Ministry approved an important package of socially-oriented anti-crisis measures, which aimed at, inter alia, increased social protection, job creation and the development of education and health infrastructures (Nuttall, 2009, p. 50).

Table 3

Tajikistan: Key Macroeconomic and Financial Sector Indicators

	2000	2002	2004	2005	2006	2007	2008
GDP growth (in real terms, %)	8.3	9.1	10.6	6.7	7.0	7.8	7.9
Current account balance (% of GDP)	-6.0	-3.6	-4.0	-2.7	-2.8	-11.2	-8.8
Net FDI flows (% of GDP)	2.4	3.0	13.1	2.4	2.4	4.3	3.8
Gross external debt (% of GDP)	120.7 ¹	105.8	55.3	50.9	42.2	40.6	42.5
Gross reserves excl. gold (% of GDP)	8.7	8.1	9.0	4.0	4.0	2.9	3.9
General government budget balance (% of GDP) ²	-5.6	-2.4	-2.4	-2.9	1.7	-6.2	-6.2
CPI inflation (year-end, %)	60.8	14.5	5.7	7.1	12.5	19.7	11.8
Exchange rate: TJS/USD (annual average)	2.20	2.76	2.97	3.12	3.30	3.44	3.43
Level of monetization (M2/GDP, %)	8.5	10.0	11.7	13.0	16.5	21.4	21.2
Credit to the private sector (% of GDP)	13.6	16.2	17.4	17.2	16.0	28.9	31.4
of which: foreign currency-denominated (%)	..	..	56.9	57.6	66.9	68.2	53.2
of which: nonperforming (%)	10.8	84.2	18.7	13.8	11.3	4.9	..
Asset share of foreign-owned banks (%) ³	71.9	1.8	6.2	8.9	6.5	6.6	..
Capital adequacy ratio (%)	..	..	38.7	34.2	27.8	19.4	..

Source: National statistics, IMF, EBRD, ADB.

Note: Figures for 2008 are preliminary data.

¹ 2001.

² Including externally financed public investment programs.

³ Including credit unions.

3.4 Turkmenistan

For more than 15 years since the collapse of the USSR (late 1991), Turkmenistan has upheld economic policies guided by central planning (production targets, state-driven capital formation, key price controls), dominant public ownership, rigorous state control over foreign trade and payments. Answering to central instructions, the small and almost entirely state-owned banking sector has performed the function of on-lending directed credits at low interest rates to state-owned firms. But following former President Niazov's death in December 2006, the new president of the republic, Berdymukhamedov, has pursued a cautious course of economic reform and opening up the country since 2007. Turkmenistan is very rich in hydrocarbon resources, particularly natural gas deposits beneath the Caspian Sea (hydrocarbons make up 85% to 90%, gas about half of total exports – see table 3 in the annex).¹⁷

Despite infrastructural bottlenecks, Turkmenistan has benefited from rising prices and quantities of exported resources in recent years. While official statistics probably overstate it, GDP growth seems to have been strong recently (over 11% p.a. on average in 2005–2008, according to IMF estimates, see table 4). Economic expansion has been driven by sizable inflows of export proceeds and by public investment campaigns. Continuing increases of hydrocarbon prices coupled with import controls have contributed to driving up trade, current account and budget

¹⁷ Although relatively large, Turkmenistan is Central Asia's least open economy: Turkmen exports and imports of goods and nonfactor services together equaled but 55% of GDP in 2007 (table 2 in the annex).

surpluses, enabling the country to successively reduce its external debt and boost its international reserve position. In contrast, until recently, the nonmarket environment has not attracted much foreign private investment outside the oil sector.

Prior to 2008, in an environment of strong foreign currency inflows (export proceeds) and strict exchange controls, the authorities conducted generally tight macroeconomic policies through monetary, fiscal and administrative means. The Central Bank of Turkmenistan (CBT) ran a dual exchange rate system (with the official rate of the Turkmen manat pegged to the U.S. dollar and a parallel rate, separated by a spread of about 450%). Access to foreign exchange as well as to domestic currency was rigorously rationed. All foreign trade transactions required the approval of the State Commodity Exchange (Comex). Given this type of pre-transition framework, the level of monetization has been stagnating and the credit-to-GDP ratio even contracting until most recently. Reserve money growth has been controlled through variations of the volume of directed credits as well as through export-driven foreign currency purchases by the central bank, which have been partly sterilized through fiscal measures. Budgets have been balanced or – more recently – in surplus; however, surpluses have partly been achieved by cutting back services, sequestering expenditures or accumulating arrears, i.e. by defaulting on public obligations. Shares of hydrocarbon export revenues have been saved in the Foreign Exchange Reserve Fund (FERF) and other extra-budgetary funds.

The major reform step of 2008 was exchange rate unification (supported by the IMF). After expeditious preparations, on May 1, 2008, the official and parallel market rates were unified at the mid-point, a level assessed to be broadly consistent with the country's robust external position. In June 2008 new foreign exchange regulations were issued that committed the authorities to provide unrestricted access to foreign currencies for making payments for current international transactions. Over 100 exchange offices across the country were opened. The CBT supports a stable unified rate, which may serve as a nominal anchor for the economy (IMF, 2008c, p. 3).¹⁸ The authorities approved a new constitution that highlights the protection of private property rights and passed new laws and legal reforms on foreign investment. Despite the authorities' tight macroeconomic stance, the exchange rate unification, selective price adjustments and hikes in prices of imported foodstuffs contributed to pushing up CPI inflation from 8.7% in December 2007 to 12.0% a year later (table 4). Competition in the banking sector is to be raised, including by gradually allowing the entry of foreign credit institutions.

Notwithstanding its relative isolation, Turkmenistan is not aloof from the global economy and the current crisis. The Turkmen economy is being affected – to a limited degree – by sharply declining commodity export demand, prices and terms of trade.¹⁹ The authorities intend to further boost budgetary capital expenditure in 2009.

¹⁸ *The manat continues to be nonconvertible for balance of payments transactions (Article XIV of IMF Articles of Agreement), i.e. for transactions on the current as well as the capital and financial accounts.*

¹⁹ *The shutdown of Turkmenistan's main gas export pipeline to Russia (due to an explosion in early April 2009) halted most gas exports for at least three months.*

Table 4

Turkmenistan: Key Macroeconomic and Financial Sector Indicators

	2000	2002	2004	2005	2006	2007	2008
GDP growth (in real terms, %) ¹	18.6	15.8	14.7	13.0	11.4	11.6	9.8
Current account balance (% of GDP)	13.6	13.0	1.2	10.5	16.3	16.1	19.6
Net FDI flows (% of GDP)	4.3	6.2	5.2	5.0	7.0	6.2	6.3
Gross external debt (% of GDP)	72.2	37.1	17.9	11.4	7.0	4.9	..
Gross reserves excl. gold (% of GDP) ²	59.9	52.4	39.6	55.0	78.8	103.7	..
General government budget balance (% of GDP) ³	-0.3	0.2	1.4	0.8	5.3	3.9	4.3
CPI inflation (year-end, %)	7.4	7.8	9.0	10.4	7.1	8.6	12.0
Exchange rate: TMM/USD (annual average) ⁴	8,477	10,098	10,375	11,015	10,882	10,721	23,000
Level of monetization (M3/GDP, %)	19.4	13.0	12.3	10.2	9.2	14.9	..
Credit to the economy (% of GDP)	..	37.1	23.7	18.1	14.0	15.1	..
of which: foreign currency-denominated (%)	..	64.7	55.7	47.0	44.3	34.4	..
of which: nonperforming (%)	..	0.3	0.4	0.3	0.2	0.2	..
Asset share of foreign-owned banks (%)	1.3	1.7	1.0	1.0	1.0	1.1	..

Source: National statistics, IMF, EBRD, ADB.

¹ Official statistics until 2004, IMF estimates thereafter.

² Includes foreign currency reserves of the CBT plus the Foreign Exchange Reserve Fund (FERF).

³ Significant off-budget expenditures occur through extra-budgetary funds and lending.

⁴ The series refers to a weighted average between the official rate (which until exchange rate unification in May 2008 remained stable vis-à-vis the U.S. dollar at 5,200) and the curb rate (parallel forex market), as calculated by the EBRD.

Note: Figures for 2008 are preliminary data.

3.5 Uzbekistan

Since independence (late 1991), Uzbekistan has followed a national strategy of self-sufficiency and import substitution (“localization program”) and has conserved some components of the former central planning system, including compulsory state orders, directed credits, a large public sector encompassing most banks, multiple exchange rates, rigorous control of foreign trade and of cash circulation inside and outside banks. While some of these reins have since been eased (e.g. elimination of multiple exchange rates and formal adoption of current account convertibility of the Uzbek sum in October 2003), business activity continues to be saddled with layers of bureaucracy (tightening of trade restrictions and cash rationing in 2002–2003, which partly cancelled out the liberalizing effect of convertibility). The authorities have used banks as agents for supplying state-guaranteed credits to state-owned enterprises and for the financial monitoring of and collecting taxes from clients. This has undermined public confidence in the banking sector and financial intermediation has been kept at one of the lowest levels in the CIS and the transition world (Barisitz, 2007, pp. 146–147).

Nevertheless, the country has benefited from favorable market conditions and high prices for its major export commodities, which are somewhat diversified (gold, cotton, hydrocarbons, metallurgy and machinery), affording some protection from boom and bust cycles. In recent years, rising inflows of remittances from Russia and Kazakhstan have reached at least 15% of GDP and stimulated internal demand. Expanding current account surpluses (also due to strong import protection) have enabled a steady and substantial reduction of foreign debt and the build-up of sizable gross reserves (see table 5). Buoyant Uzbek economic growth (average annual rate of about 8% in 2004–2008) has thus been led by exports, remittances, and, to a smaller extent, state-driven investment programs.

The authorities have dealt with the persistent and strong foreign exchange inflows in recent years by adhering to generally tight monetary, fiscal and administrative policies. The Central Bank of Uzbekistan (CBU) has controlled reserve money growth through raising banks' mandatory deposits and hiking the refinancing rate, but also through the limited use of indirect monetary instruments (partial sterilization), namely CBU certificates of deposit and Treasury bills. At the same time, in order to support export competitiveness, the monetary authority has conducted a policy of de facto gradual nominal depreciation of the sum vis-à-vis the U.S. dollar, which, however, was varied according to the circumstances: Increasing inflationary pressures in 2005 and 2006 triggered a temporary tightening of the policy stance, which in May 2006 gave rise to the reclassification of the exchange rate regime from a managed float to a conventional U.S. dollar peg. The temporary stabilization of inflation in 2007 (at a high level of about 12%) was followed by the authorities' stepped-up interventions on the foreign currency market and a changed behavior of the nominal exchange rate, which in early 2008 gave rise to a renewed reclassification of the regime as a crawling peg – largely tying up again with the above-mentioned gradual nominal depreciation strategy (IMF, 2008d, p. 16).

Given buoyant (export-related) budgetary revenues, budget surpluses have been achieved since the early years of the new millennium. Fiscal policy has been instrumental in sterilization efforts by accumulating government deposits at the CBU and by building up the Uzbekistan Fund for Reconstruction and Development (UFRD), an entity established for fiscal stabilization and investment. As at end-September 2008, the UFRD comprised about EUR 600 million (4% of GDP).

Notwithstanding the rigid banking environment, some recent developments have been promising. Government-guaranteed loans are on the decline and the traditional practice of on-lending foreign credit lines under state supervision has waned over time, lowering the foreign currency exposure of domestic banks. However, as long as banks are not freed from their non-core functions, including financial oversight and tax collection, there appears to be little prospect of any market-oriented take-off of the sector (IMF, 2008d, p. 14).

Rising inflation constituted the country's major macroeconomic challenge in 2008, while the deepening global economic crisis has led to some refocusing of policies in 2009. Inflationary pressures in 2008 emanated from the global rise in food and energy prices in the first half of the year, persisting strong foreign currency inflows, adjustments of government-administered wages and prices of utilities as well as the slight nominal depreciation of the sum. These pressures were somewhat mitigated by increased CBU sterilization efforts, a sizable budget surplus (5% of GDP), the further accumulation of foreign currency proceeds in the UFRD and export restrictions for several food items. Still, CPI inflation grew in 2008 to 14.4% (year on year, the highest level since 2002, as shown in table 5).

Given its insulated financial system, Uzbekistan has not been directly affected by the international financial crisis. Instead, the global economic downturn is impacting the economy via exports and remittances.²⁰ At end-2008, the Uzbek president outlined a large-scale anti-crisis package in four decrees. It targets

²⁰ The authorities have reported GDP growth of 7.9% in the first quarter of 2009 (year on year), which is only a slight slowdown compared to the year-earlier period.

export promotion, further emphasizes import substitution, promotes higher energy efficiency, instructs banks to step up financial support of the real sector and provides for the intensified development of small and medium-sized enterprises. The total cost of the package is estimated at 4% of GDP.

Table 5

Uzbekistan: Key Macroeconomic and Financial Sector Indicators

	2000	2002	2004	2005	2006	2007	2008
GDP growth (in real terms, %)	3.8	4.0	7.7	7.0	7.3	9.5	9.0
Current account balance (% of GDP)	2.4	1.4	9.9	13.1	17.2	19.1	16.9
Net FDI flows (% of GDP)	0.8	0.8	1.6	0.6	1.1	3.3	3.8
Gross external debt (% of GDP)	48.9	44.1	37.3	31.3	22.8	17.4	15.4
Gross reserves excl. gold (% of GDP)	7.5	15.5	18.2	19.4	26.1	33.2	38.3
General government budget balance (% of GDP) ¹	-2.5	-1.9	0.6	1.2	5.2	5.1	5.0
CPI inflation (year-end, %)	28.2	21.6	9.1	12.3	11.4	11.9	14.4
Exchange rate: UZS/ USD (annual average) ²	361	885	999	1,072	1,220	1,264	1,320
Level of monetization (M3/GDP, %)	12.2	10.6	12.2	14.4	15.2	16.3	..
Credit to the economy (% of GDP)	27.9	34.0	24.6	21.8	17.4	15.0	15.9
of which: foreign currency-denominated (%)	..	80.0	73.2	68.8	56.9	43.3	..
of which: nonperforming (%)	..	..	2.1	8.9	3.0	2.8	2.8
Asset share of foreign-owned banks (%)	2.2	3.2	4.4	..	..	..	..
Stock market capitalization (% of GDP)	0.6	0.4	0.1	0.3	4.3	..	..

Source: National statistics, IMF, EBRD, ADB.

¹ Includes extra-budgetary funds, but excludes local government.

² Dual exchange rates were in operation until October 2003. Data show a weighted average between official, bank and parallel market rates (as referred to by the EBRD).

Note: Figures for 2008 are preliminary data.

4 Aside: Austrian Banks' Presence in Central Asia

Austrian banks are present in Kazakhstan and Kyrgyzstan. In 2001, Raiffeisen International became a minority shareholder of Bank Turan-Alem (BTA), the second-largest (in terms of assets) Kazakh bank at the time. Since the planned increase of its 7.7% capital participation to majority shareholding was not feasible, the group sold its stake in August 2006. After looking for takeover targets for over a year, Raiffeisen reportedly concluded that the prices of possible targets were too high. Therefore, the bank changed its strategy and opted for setting up a green-field subsidiary. However, in reaction to the global economic crisis and in order to cut costs, Raiffeisen in March 2009 suspended these plans (Silk Road Intelligencer, 2009).

In June 2007, UniCredit Bank Austria paid EUR 1.63 billion for a 92% stake of ATF Bank, the sixth-largest Kazakh credit institution of the time. After achieving a net (after-tax) profit of EUR 43 million in 2007, ATF recorded a net loss of almost the same size (EUR 41 million) in 2008. At end-2008, ATF had a market share of 8% of total assets of the Kazakh banking sector. In order to cope with the worsened global and national economic situation and to comply with requests by the Agency of the Republic of Kazakhstan on Regulation and Supervision of Financial Markets and Organizations (FMSA), ATF bank (which meanwhile had become the fifth-largest of the country) in March 2009 approved a rights issue to raise its own capital by 30%. Other restructuring measures decided the same month included staff cuts and a ban on expansion of the branch network in a quest to bring costs down. At end-April 2009, overdue loans were reported to make up

over a quarter of total ATF credits. In early May, ATF bank fully redeemed a EUR 380 million loan; part of the payment was refinanced by the parent bank, UniCredit (Economist Intelligence Unit, 2009; Kazakhstan Newslines, 2009).

In the Kyrgyz Republic, ATF Bank acquired Energobank (a mid-sized credit institution) and renamed it ATF Bank Kyrgyzstan. At end-2008, ATF Bank Kyrgyzstan – now controlled by UniCredit Bank Austria – was the second-largest credit institution (in terms of assets) and possessed the largest loan portfolio of the country (18% of total bank credits).

5 Comparative Assessment and Conclusions

5.1 Policy Environment: Resource-, Capital- and Remittance-Driven Economies

Looking at policy conditions in Central Asia, a number of salient features can be summarized. The institutional economic framework varies remarkably across the region: Kazakhstan and the Kyrgyz Republic are market-oriented reforming economies; Tajikistan and Uzbekistan can be characterized as hybrid economies, combining important elements of centralized as well as decentralized planning; finally, as a rigidly centralized economy, Turkmenistan has conserved many ingredients of the Soviet system, but is currently undertaking cautious reform steps. All Central Asian countries run managed floating exchange rate regimes, some of which, however, have temporarily been reclassified as de facto pegs or crawling pegs. Kazakhstan and Kyrgyzstan achieved current account convertibility already in the 1990s, the former even liberalized its capital account in early 2007. Tajikistan and Uzbekistan introduced current account convertibility only recently; yet in the case of Uzbekistan, convertibility is largely canceled out by heavy trade restrictions and cash rationing. In institutional conformity, the Turkmen manat is nonconvertible (see table 6).

At least up to 2007, strong economic expansion was recorded throughout the region. This expansion benefited from the post-Soviet economic recovery process (following a partly deep and extended transition depression topped by the repercussions of the Russian crisis of 1998). Inflows of various kinds drove this growth: hydrocarbon export proceeds (Kazakhstan, Turkmenistan and, to a lesser extent, Uzbekistan), other commodities' export proceeds (Kyrgyzstan, Tajikistan, Uzbekistan), workers' remittances (Kyrgyzstan, Tajikistan and, to a lesser extent, Uzbekistan) as well as FDI and other capital inflows (Kazakhstan, Kyrgyzstan). Furthermore, credit booms played a role (in Kazakhstan and, to a smaller degree, in the Kyrgyz Republic and Tajikistan). Finally, state-driven investment programs (forced growth) made their contribution (in Turkmenistan and, to a lesser extent, Uzbekistan). The above-mentioned inflows did not only exert influence on the varying levels of inflation experienced, but also on appreciation pressures that emerged over these years. Then, from the second half of 2007 at least until mid-2008, inflation rose sharply everywhere. This was largely supply-side driven and reflected skyrocketing global and domestic energy and food prices, partly exacerbated by bad regional harvests. In most countries, inflation spiked in the late summer of 2008, before declining again under the impact of the global economic crisis.

The Central Asian impact of the U.S. subprime crisis of 2007 and of the deterioration of the U.S. and global financial crisis of 2008 has been heterogeneous. The Kazakh financial sector, one of the most developed in the CIS and highly indebted abroad, was severely struck by the sudden stop of capital inflows. This contributed to a persisting credit crunch, a mortgage crisis (bursting of housing bubble) and to the illiquidity or insolvency of some large banks. The global liquidity squeeze only indirectly, if still markedly, affected the fledgling Kyrgyz financial sector, dominated by Kazakh FDI: Parent banks recalled credit lines, which effectively ended the modest Kyrgyz credit boom. The Tajik financial sector is still at an early stage of development and possesses only weak linkages to international markets, but here too the deepening of the global financial market crisis contributed to bringing credit growth down again after a sudden surge. The Turkmen and Uzbek sectors have remained systemically insulated from the global crisis.

Table 6

Comparative Overview of Central Asia

	GDP per capita (EUR) ¹		GDP growth (%)		Exchange rate regime	Domestic currency and convertibility	General government budget balance (% of GDP)		Current account balance (% of GDP)		CPI inflation (year-end, %)		Credit to private sector/ to economy (% of GDP)		Asset share of foreign-owned banks (%)	
	2003	2008	2003	2008			2003	2008	2003	2008	2003	2008	2003	2008	2003	2008
Kazakhstan	1,832	5,812	9.3	3.2	managed floating with no preannounced path for exchange rate; Oct. 2007: de facto peg to U.S. dollar	Kazakh tenge (KZT); June 1996: current account convertibility; Jan. 2007: capital and financial account convertibility	2.7	-2.1	-0.9	5.3	6.8	9.5	21.9	45.9	56.9	14.8 ²
Kyrgyz Republic	337	645	7.0	7.6	managed floating with no pre-announced path for exchange rate	Kyrgyz som (KGS); Mar. 1995: current account convertibility	-4.7	-1.3	1.7	-6.5	5.6	19.8	4.8	18.7	61.2	58.7 ²
Tajikistan	217	522	10.2	7.9	managed floating with no pre-announced path for exchange rate	Tajik somoni (TJS); Dec. 2004: current account convertibility	-1.8	-6.2	-1.3	-8.8	13.7	11.8	14.0	31.4	3.6	6.6 ²
Turkmenistan	1,076	1,845 ²	17.1	9.8	dual exchange rate system, official rate pegged to U.S. dollar; May 2008: exchange rate unification, aim at stable rate	Turkmen manat (TMM); non-convertibility	-1.3	4.3	5.2	19.6	3.1	12.0	28.0	15.1 ²	1.6	1.1 ²
Uzbekistan	342	671	4.2	9.0	multiple exchange rate system; Oct. 2003: unification of exchange rate, managed float; May 2006: U.S. dollar peg; Jan. 2008: crawling peg	Uzbek sum (UZS); Oct. 2003: formal current account convertibility	0.1	5.0	8.9	16.9	7.8	14.4	28.9	15.9	4.3	4.4 ³
Russia (for comparison)	2,640	8,036	7.3	5.6	since late 1998: managed floating with no pre-announced path for exchange rate	Russian ruble (RUB); June 1996: current account convertibility; July 2006: capital and financial account convertibility	1.3	5.2	8.2	5.9	12.0	13.3	23.0	48.0	7.4	18.7

Source: National statistics, IMF, EBRD, ADB, wiw.

¹ Converted at market exchange rate.

² September 2008.

³ 2004.

Note: Figures for 2008 are preliminary data or estimates.

The collapse of hydrocarbon prices contributed to sharply cutting Kazakhstan's economic growth in 2008 and may contribute to pushing it into recession in 2009. Banks' balance sheets will likely worsen further. After still boasting strong expansion in 2008, the Kyrgyz Republic and Tajikistan risk a substantial deceleration in 2009, owing to both plummeting remittance inflows and falling export prices. In contrast, plummeting raw material prices are the only major external shock feeding through to Turkmenistan and Uzbekistan, which may help explain why their growth rates are not expected to budge that much.

5.2 Monetary Policy and Banking Reform

5.2.1 The Pre-Crisis Period (up to 2007): Managing Strong Inflows by Various Means

Given strong foreign exchange inflows (export proceeds, remittances and/or capital) into Central Asia through 2008, all countries have been confronted, at least to some degree, with the potentially conflicting dual goals of combating inflation while preventing too strong currency appreciation (to support competitiveness). They have all reacted, to varying degrees, by monetary targeting, (partially sterilized) foreign currency market interventions, adjusting key interest rates and tightening fiscal policies. Monetary targeting has been the most often used instrument. Foreign currency market interventions (mostly purchases) have run counter to the price stability goal, as they prevented nominal appreciation from exerting a disinflationary impact. Moreover, in as far as they remained unsterilized, they rendered the pursuit of monetary targeting more difficult. Interest rate policy has not tended to be very effective, because key rates have been negative in real terms (except in Uzbekistan), and monetization has been relatively low in most cases, implying a weak monetary transmission mechanism. However, tightening fiscal policies has often served as effective sterilization instrument: budget surpluses and transfers to extra-budgetary funds (in Kazakhstan, Turkmenistan and Uzbekistan), repayment of public external debt, and accumulation of government deposits in the central bank.

Hybrid or highly centralized economies (Tajikistan, Turkmenistan and Uzbekistan) have also preferably resorted to direct administrative interventions such as price controls, trade restrictions, surrender requirements, foreign currency and domestic cash rationing or the allocation of directed credits. To sum up, the problem of conflicting goals has most often been pragmatically solved: While generally emphasizing the importance of the price stability goal, Central Asian monetary policies have repeatedly compromised with the competitiveness goal.

5.2.2 The Crisis Period (since 2007): Coping with External Shocks – Skyrocketing Prices, Liquidity Squeeze and Global Recession

The unstable period following the summer of 2007, including the inflationary spike and the liquidity squeeze on the back of the global financial turmoil, immediately substituted a new policy dilemma for the old one: whether to give priority to fighting inflation or to help banks cope with their solvency problems. In the event, this only presented a dilemma for Kazakhstan, due to its relatively large banking sector. The Kazakh authorities on repeated occasions (in late 2007 and again late 2008) lent priority to helping credit institutions, given the systemic importance of the sector in this country and the severity of the crisis. Unavoidably, the liquidity injections partly contributed to the inflationary pressures. However,

in times of relative calm, like in the first half of 2008, the NBK temporarily refocused activities on anti-inflationary measures.

The Kyrgyz banking sector is much smaller and in comparatively good shape. Therefore, the NBRK gave priority to fighting inflation; only most recently have contingency plans for supporting the banking sector emerged. Tajik conditions and experience have been comparable. Given the nonmarket orientation and “independence” of their banking systems from external economic shocks, the Turkmen and Uzbek authorities have not faced a policy dilemma in pursuing price stability recently. Nevertheless, with inflation in both countries attaining double digits in 2008, results have not been more impressive than elsewhere. Turkmen and Uzbek inflation dynamics have also been influenced by strong idiosyncratic factors: Rising price pressures in 2008 in these two economies probably have more to do with internal institutional adjustments and the selective release of built-up inflationary pressures.

The most frequently used measures to combat the inflationary spike of 2007–2008 in Central Asia have been fiscal tightening (except in Kazakhstan), interest rate increases (except in Turkmenistan and Uzbekistan, and despite this instrument’s limited efficacy), monetary sterilization efforts and stepped-up price controls. However, while global economic forces appear to have been decisive in pushing up inflation in most of the region, they also seem to have had the pivotal impact in bringing it down again, authorities’ efforts notwithstanding.

The current world financial and economic crisis since autumn 2008 has hit the Kazakh banking system in particular. Kazakh banks are continuing to struggle intensively, assisted by major liquidity injections and even by nationalization measures. These nationalizations have – at least temporarily – reversed historic privatization results achieved over a decade ago, however, they have apparently not prevented defaults. Notwithstanding the important assistance efforts so far undertaken by the authorities, in the case of Kazakhstan some observers may be inclined to add a further and highly topical economic policy dilemma, namely of choosing between reputational damage by default on the foreign debt of nationalized banks (including possible financial repercussions) versus financial damage through depletion of international and oil stabilization fund reserves. In this context, the authorities have so far apparently opted for pursuing the former route.

Another striking feature of manifold Central Asia is that the pervasive lack of reforms and different institutional nature may have saved the Turkmen and Uzbek banking sectors from the contagion effects of the international financial crisis, but for many years it has also prevented them from fulfilling the growth-enhancing functions of establishing and running viable payment systems and providing market-driven intermediation and investment finance. This once again underlines the degree of institutional heterogeneity and the selectiveness of exposure to globalization attained by a region that had featured a largely common point of departure less than two decades ago.

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Annex of Tables

Table 1

Demand Components of GDP in Selected Countries

Kazakhstan

	2002	2003	2004	2005	2006	2007
	% of GDP					
Household consumption	58.4	56.3	53.5	49.4	45.5	45.8
Government consumption	12.4	11.6	11.6	11.2	10.1	11.2
Gross fixed capital formation	25.7	23.8	25.1	27.8	30.0	30.5
Inventory adjustments	3.5	2.8	1.2	3.0	3.7	5.6
Net exports of goods and services	0.0	5.6	8.6	8.8	10.8	6.9

Kyrgyz Republic

	2002	2003	2004	2005	2006	2007
	% of GDP					
Household consumption	67.5	77.9	76.0	84.5	95.1	87.5
Government consumption	18.6	16.8	18.2	17.5	18.0	17.1
Gross fixed capital formation	16.5	13.8	14.8	16.2	23.4	25.0
Inventory adjustments	1.1	-2.0	-0.3	0.2	0.8	1.6
Net exports of goods and services	-3.8	-6.5	-8.7	-18.5	-37.3	-31.2

Source: IMF.

Table 2

Trade Openness

Exports of goods and nonfactor services to GDP (in %, 2007)

Kazakhstan	50.1
Kyrgyz Republic	52.9
Tajikistan	20.7
Turkmenistan	36.4
Uzbekistan	40.5

Exports and imports of goods and nonfactor services to GDP (in %, 2007)

Kazakhstan	93.3
Kyrgyz Republic	137.1
Tajikistan	89.9
Turkmenistan	55.1
Uzbekistan	70.8

Source: IMF.

Table 3

Major Traded Goods

Principal exported products or product groups (share in total exports, 2006)

	First	Second	Third
Kazakhstan	72% mineral products (oil, gas, coal a.o.)	16% nonprecious metals (copper a.o.)	4% chemicals
Kyrgyz Republic	27% precious stones and metals (gold a.o.)	22% minerals	12% food and beverages
Tajikistan	75% aluminum	9% cotton	4% electricity
Turkmenistan	50% natural gas	32% oil and oil products	2% cotton
Uzbekistan	17% cotton fibers	13% energy	13% ferrous and nonferrous metals

Principal imported products or product groups (share in total imports, 2006)

	First	Second	Third
Kazakhstan	27% machinery and equipment	16% transport equipment	14% mineral products
Kyrgyz Republic	31% mineral products and energy	16% machinery and equipment	14% food and beverages
Tajikistan	23% aluminum oxide	13% oil products and natural gas	5% grain
Turkmenistan	65% finished products	34% consumption goods	1% other
Uzbekistan	41% machinery and equipment	15% chemicals, synthetic materials	10% ferrous and nonferrous metals

Source: National statistics, Der Fischer Weltalmanach 2009.

Table 4

Major Trading Partners

Principal export destinations (ranking, share in total exports, 2007)

	First	Second	Third
Kazakhstan	15.5% China, P.R.	11.5% Germany	11.2% Russia
Kyrgyz Republic	20.7% Russia	19.9% Switzerland	18.1% Kazakhstan
Tajikistan	38.9% Netherlands	32.6% Turkey	6.6% Russia
Turkmenistan	51.2% Ukraine	18.4% Iran	5.0% Turkey
Uzbekistan	22.4% Russia	10.4% Poland	9.4% Turkey

Principal import suppliers (ranking, share in total imports, 2007)

	First	Second	Third
Kazakhstan	35.4% Russia	22.1% China, P.R.	8.0% Germany
Kyrgyz Republic	40.5% Russia	14.7% China, P.R.	12.9% Kazakhstan
Tajikistan	32.1% Russia	13.1% Kazakhstan	10.8% China, P.R.
Turkmenistan	14.3% U.A.E.	11.6% Russia	10.3% Turkey
Uzbekistan	30.1% Russia	13.3% China, P.R.	13.0% South Korea

Source: IMF.

Table 5

Russia: Key Macroeconomic and Financial Sector Indicators (for Comparison)

	2000	2002	2004	2005	2006	2007	2008
GDP growth (in real terms, %)	10.0	4.7	7.1	6.4	7.4	8.1	5.6
Current account balance (% of GDP)	18.0	8.4	10.1	11.1	9.8	6.1	5.9
Net FDI flows (% of GDP)	-0.2	-0.1	0.3	0.1	0.7	1.0	0.4
Gross external debt (% of GDP)	61.5	44.1	36.1	33.7	31.6	35.7	29.3
Gross reserves excl. gold (% of GDP)	9.3	13.8	21.0	23.8	30.9	36.9	25.5
General government budget balance (% of GDP)	3.2	0.9	4.5	8.1	8.4	6.0	5.2
CPI inflation (year-end, %)	20.1	15.1	11.7	10.9	9.0	11.9	13.3
Exchange rate: RUB/USD (annual average)	28.13	31.35	28.81	28.30	27.34	25.58	24.81
Level of monetization (M2/GDP, %)	15.8	19.7	26.0	27.9	33.5	40.2	..
Credit to the private sector (% of GDP)	13.3	17.7	23.7	26.4	31.3	39.0	42.0
of which: foreign currency-denominated (%)	..	..	27.1	28.0	24.5	22.6	24.6
of which: nonperforming (%)	9.6	6.4	3.3	2.6	2.4	2.5	3.8
Asset share of foreign-owned banks (%)	9.5	8.1	7.6	8.3	12.1	17.2	18.7
Capital adequacy ratio (%)	..	19.1	17.0	16.0	14.9	15.5	16.8
Stock market capitalization (% of GDP)	15.3	36.7	44.6	72.9	103.4	111.8	..

Source: National statistics, IMF, EBRD.

Note: Figures for 2008 are preliminary data.

Highlights

Sir Tony Atkinson Gives 14th Global Economy Lecture at the OeNB

Compiled by Philipp
Schmidt-Dengler

“The Global Distribution of Income: Past Trends and Future Prospects” was the title of the lecture Sir Tony Atkinson, Professor of Economics and Fellow of Nuffield College, Oxford, gave at the Oesterreichische Nationalbank (OeNB) on May 7, 2009. Doris Ritzberger-Grünwald, Head of the OeNB’s Foreign Research Division, and Michael Landesmann, Director of the Vienna Institute for International Economic Studies (wiiw), provided the opening remarks to this 14th installment of the OeNB’s and the wiiw’s joint Global Economy Lecture series.

Atkinson analyzed the distribution of income between countries and within countries. To analyze the distribution between countries, Atkinson compared GDP per capita across countries and described the evolution of the share in the 12 richest countries in total world income; to analyze the distribution within countries, he used Lorenz curves and Gini coefficients as well as the share in total income earned by a country’s top earners.

The above measures yield a clear picture of the international distribution of income. Following the Industrial Revolution, international incomes diverged until the middle of the 20th century, with inequality declining in the second half of the past century. This was largely due to large countries becoming middle-income countries. However, the richest countries kept attaining a larger share of global income, and the poorest countries were left further behind during this period.

Within-country inequality substantially declined in industrialized countries until the last quarter of the 20th century. During the past 30 years, we have seen an increase in both overall inequality (as measured by the Gini coefficient) and the shares of top-income earners in Anglo-Saxon countries. The Nordic countries and Germany have experienced a somewhat later rise in income inequality. Hence, there is some evidence of a U-shaped evolution of inequality. This is explained with top capital and wage incomes first declining, and in particular top wage incomes increasing again in recent years.

Finally, Atkinson discussed the likely impact of the current crisis on income distribution. Evidence from past banking crisis-induced recessions shows an increase in income inequality. Atkinson argued that a similar effect must be expected as a result of the current crisis.

The ensuing discussion focused on the role of policy – in particular tax reforms – in the evolution of the observed trends. In light of the current financial crisis, it was pointed out, one needs to look carefully at both wealth and income. The question of who lost how much is difficult to answer as most available wealth statistics do not mark to market.

Selected Abstracts

The selected abstracts below alert readers to studies on CESEE topics in other OeNB publications. You may find the full-length contributions at www.oenb.at.

Direct Cross-Border Lending by Austrian Banks to Eastern Europe

Claus Puhr,
Markus Schwaiger,
Michael Sigmund

Direct cross-border lending is an important component in the ongoing process of financial deepening in Central, Eastern and Southeastern Europe (CESEE) and the Commonwealth of Independent States (CIS). We use a loan-level dataset of Austrian banks to study the characteristics as well as the major driving forces of direct cross-border lending in CESEE and the CIS. Direct cross-border lending to nonbanks by Austrian banks expanded rapidly over the last few years; the bulk of loans is extended to corporate customers and is denominated in a foreign currency, with the euro taking a prominent position. By means of a series of univariate analyses, we provide support for the relevance of geographic proximity – small and medium-sized banks mainly lend to neighboring countries. Banks' direct lending also seems to follow nonfinancial FDI by Austrian corporates to CESEE and the CIS. We furthermore analyze the interdependencies between direct (i.e. by Austrian headquarters) and indirect (i.e. by local subsidiaries) cross-border lending and find support for a complementary effect between the two. In addition, host country factors such as GDP growth, private sector credit growth, financial intermediation growth and wage growth are also associated with direct lending growth.

Published in *Financial Stability Report 17*.

Banking and Financial Stability in Russia and the Euro Area amid International Financial Market Turbulences

Stephan Barisitz,
Gernot Ebner,
Mathias Lahnsteiner,
Johannes Pann

This study was drafted during the preparation of the Fifth Joint High-Level Eurosystem – Bank of Russia Seminar hosted by the OeNB in Vienna on March 11–12, 2009. The first part of the study illustrates developments in the euro area, where the financial sector suffered to some extent from spillover effects from the first waves of the subprime crisis and later more substantially from the demise of Lehman Brothers. While rescue actions taken by national authorities and the ECB mitigated crisis effects, current challenges arise from a cyclical deterioration of credit quality and further adverse developments in global financial markets. The study highlights the considerable exposure of euro area banks to emerging Europe in general and their more modest exposure to Russia in particular. It then discusses developments in Russia: Embarking from a quite favorable macroeconomic environment, Russia was caught up in the global financial turbulences only in recent months, but the impact was heavy and exacerbated by structural weaknesses of the Russian economy. The Russian authorities' crisis response measures have been substantial and contributed to staving off a systemic banking crisis, but the sector remains fragile. The paper concludes with comments on lessons learnt: Confidence – which is the foundation of the financial system – needs to be restored. Structural and institutional problems have to be addressed adequately. Interbank markets should be made more resilient to shocks.

Published in *Financial Stability Report 17*.

Olga Radzyner Award for Scientific Work on European Economic Integration

The Oesterreichische Nationalbank has established an award to commemorate Olga Radzyner, former Head of the Foreign Research Division, who died in a tragic accident in August 1999. The award is bestowed on young economists for excellent research focused on topics of European economic integration and is conferred annually. In 2009, four applicants are eligible to receive a single payment of EUR 3,000 each from an annual total of EUR 12,000.

The submitted work shall be in the form of a master's or doctoral thesis, a working paper or a scientific article, and shall be in English or in German. Authors shall submit the work before their 35th birthday and shall be citizens of any of the following countries: Albania, Bosnia and Herzegovina, Bulgaria, Croatia, the Czech Republic, Estonia, FYR Macedonia, Hungary, Kosovo, Latvia, Lithuania, Montenegro, Poland, Romania, Serbia, Slovakia or Slovenia.

To identify their work as a submission, applicants shall mark the envelope with the reference "Olga Radzyner Award" and send it to the Oesterreichische Nationalbank, Foreign Research Division, Otto-Wagner-Platz 3, PO Box 61, 1011 Vienna, Austria. The Oesterreichische Nationalbank shall receive the work submitted for the award in 2009 by October 2, 2009, at the latest.

For detailed information, please visit our website at <http://ceec.oenb.at> or contact Ms. Eva Gehringer-Wasserbauer in the Foreign Research Division of the Oesterreichische Nationalbank either by e-mail (eva.gehringer-wasserbauer@oenb.at) or by phone (+43-1-40420-5205).

Notes

Legend, Abbreviations and Definitions

Legend

x = No data can be indicated for technical reasons

.. = Data not available at the reporting date

Discrepancies may arise from rounding.

Abbreviations

BIS	Bank for International Settlements
BOFIT	Bank of Finland Institute for Economies in Transition
CEE	Central and Eastern Europe(an)
CEEC	Central and Eastern European country
CEEI	Conference on European Economic Integration (OeNB)
CESEE	Central, Eastern and Southeastern Europe(an)
CIS	Commonwealth of Independent States
CPI	consumer price index
EBRD	European Bank for Reconstruction and Development
ECB	European Central Bank
EIB	European Investment Bank
EMU	Economic and Monetary Union
ERM (II)	exchange rate mechanism (II)
ESA	European System of Accounts
ESCB	European System of Central Banks
EU	European Union
FDI	foreign direct investment
FEEI	Focus on European Economic Integration (OeNB)
GDP	gross domestic product
GFCF	gross fixed capital formation
GVA	gross value added
HICP	Harmonised Index of Consumer Prices
ILO	International Labour Organization
LFS	Labour Force Survey (EU)
IMF	International Monetary Fund
NACE	Nomenclature générale des activités économiques (Nomenclature for economic activities)
NCB	national central bank
NUTS	Nomenclature des unités territoriales statistiques (Nomenclature of territorial units for statistics)
OECD	Organisation for Economic Co-operation and Development
ÖNACE	Austrian Statistical Classification of Economic Activities
PPP	purchasing power parity
SEE	Southeastern Europe(an)
SITC	Standard International Trade Classification
SME(s)	small and medium-sized enterprise(s)
SUERF	Société Universitaire Européenne de Recherches Financières – The European Money and Finance Forum

UN	United Nations
UNCTAD	United Nations Conference on Trade and Development
WEO	World Economic Outlook (IMF)
WIFO	Österreichisches Institut für Wirtschaftsforschung (Austrian Institute of Economic Research)
wiiw	Wiener Institut für internationale Wirtschaftsvergleiche (The Vienna Institute for International Economic Studies)
WTO	World Trade Organization

National Central Banks

BNB	Bulgarian National Bank
BNR	Banca Națională a României (National Bank of Romania)
BoA	Banka e Shqipërisë (Bank of Albania)
BS	Banka Slovenije (Bank of Slovenia)
CBBH	Centralna banka Bosne i Hercegovine (Central Bank of Bosnia and Herzegovina)
CBCG	Centralna banka Crne Gore (Central Bank of Montenegro)
CBR	Central Bank of the Russian Federation (Bank of Russia)
ČNB	Česká národní banka (Czech National Bank)
HNB	Hrvatska narodna banka (Croatian National Bank)
MNB	Magyar Nemzeti Bank (Hungary's central bank)
NBP	Narodowy Bank Polski (National Bank of Poland)
NBRM	National Bank of the Republic of Macedonia
NBS	Národná banka Slovenska (Slovakia's central bank)
NBS	Narodna banka Srbije (National Bank of Serbia)
NBU	National Bank of Ukraine
OeNB	Oesterreichische Nationalbank (Austria's central bank)
TCMB	Türkiye Cumhuriyet Merkez Bankası (Central Bank of the Republic of Turkey)

ISO Currency Codes

ALL	Albanian lek
BGN	Bulgarian lev
CZK	Czech koruna
EUR	euro
HRK	Croatian kuna
HUF	Hungarian forint
KGS	Kyrgyz som
KZT	Kazakh tenge
MKD	Macedonian denar
PLN	Polish złoty
RON	Romanian leu
RSD	Serbian dinar
RUB	Russian ruble
SIT	Slovenian tolar
SKK	Slovak koruna
TJS	Tajik somoni
TMT/TMM	new Turkmen manat/Turkmen manat

TRY	Turkish lira
UAH	Ukrainian hryvnia
USD	U.S. dollar
UZS	Uzbek sum

ISO Country Codes

AL	Albania
AT	Austria
BA	Bosnia and Herzegovina
BE	Belgium
BG	Bulgaria
BY	Belarus
CY	Cyprus
CZ	Czech Republic
DE	Germany
DK	Denmark
EE	Estonia
ES	Spain
FI	Finland
FR	France
GR	Greece
HR	Croatia
HU	Hungary
IE	Ireland
IT	Italy
KG	Kyrgyzstan
KZ	Kazakhstan
LT	Lithuania
LU	Luxembourg
LV	Latvia
MD	Moldova
ME	Montenegro
MK	former Yugoslav Republic of Macedonia (FYR Macedonia)
MT	Malta
NL	Netherlands
PL	Poland
PT	Portugal
RO	Romania
RS	Serbia
RU	Russia
SE	Sweden
SI	Slovenia
SK	Slovakia
TJ	Tajikistan
TM	Turkmenistan
TR	Turkey
UA	Ukraine
UZ	Uzbekistan

Definitions

Croatia, FYR Macedonia and Turkey are candidate countries within the EU enlargement process. Candidate countries are countries which have formally applied to the EU for membership and have been officially recognized by the European Council as a candidate for membership. Accession negotiations with Croatia and Turkey were opened in October 2005. No date has been set yet for the opening of accession negotiations with FYR Macedonia.

Albania, Bosnia and Herzegovina, Montenegro, Serbia and Kosovo under UNSC Resolution 1244/99 are potential EU candidate countries, i. e. countries that may become officially recognized candidates for membership. Western Balkan countries involved in the Stabilisation and Association process are recognized as potential candidate countries.

Periodical Publications of the Oesterreichische Nationalbank

For further details on the periodical publications of the OeNB see www.oenb.at

Monetary Policy & the Economy quarterly

This quarterly publication, issued both in German and English, offers analyses of current cyclical developments, medium-term macroeconomic forecasts and studies on central banking and economic policy topics. It also summarizes the findings of macroeconomic workshops and conferences organized by the OeNB.

Focus on European Economic Integration quarterly

The Focus on European Economic Integration (FEEI) is a channel for communicating the OeNB's ongoing research on Central, Eastern and Southeastern European (CESEE) countries, thus reflecting a strategic regional research priority of the OeNB. Contributions to the quarterly FEEI include peer reviewed studies dealing primarily with macrofinancial and monetary integration as well as economic country analyses and cross-regional comparisons.

Statistiken – Daten & Analysen quarterly

This publication contains brief reports and analyses focusing on Austrian financial institutions, cross-border transactions and positions as well as financial flows. The contributions are in German, with executive summaries of the analyses in English. The statistical part covers tables and explanatory notes on a wide range of macroeconomic, financial and monetary indicators. The tables and additional information and data are also available on the OeNB's website in both German and English. This series also includes special issues on selected statistics topics published at irregular intervals.

econ.newsletter quarterly

The quarterly English-language newsletter is published only on the Internet and informs an international readership about selected findings, research topics and activities of the OeNB's Economic Analysis and Research Department. This publication addresses colleagues from other central banks or international institutions, economic policy researchers, decision makers and anyone with an interest in macroeconomics. Furthermore, the newsletter offers information on publications, studies or working papers as well as events (conferences, lectures and workshops).

For further details see www.oenb.at/econ.newsletter

Financial Stability Report semiannual

Issued both in German and English, the Financial Stability Report contains first, a regular analysis of Austrian and international developments with an impact on financial stability and second, studies designed to provide in-depth insights into specific topics related to financial market stability.

Workshops – Proceedings of OeNB Workshops

three to four issues a year

The Proceedings of OeNB Workshops were introduced in 2004 and typically comprise papers presented at OeNB workshops at which national and international experts, including economists, researchers, politicians and journalists, discuss monetary and economic policy issues. Workshop proceedings are generally available in English only.

Working Papers

about ten papers a year

The OeNB's Working Paper series is designed to disseminate, and provide a platform for discussing, findings of OeNB economists or outside contributors on topics which are of special interest to the OeNB. To ensure the high quality of their content, the contributions are subjected to an international refereeing process.

Conference Proceedings of the Economics Conference

annual

The Economics Conference hosted by the OeNB is an international platform for exchanging views and information on monetary and economic policy as well as financial market issues. It convenes central bank representatives, economic policy-makers, financial market players, academics and researchers. The conference proceedings comprise all papers presented at the conference.

Conference Proceedings of the Conference on European Economic Integration

annual

The OeNB's Conference on European Economic Integration (CEEI) focusses on Central, Eastern and Southeastern European issues and the ongoing EU enlargement process. The Conference Proceedings comprise contributions to the CEEI and are published in English by a renowned international publishing house. For further details see <http://ceec.oenb.at>

Annual Report

annual

The Annual Report of the OeNB provides a broad review of Austrian monetary policy, economic conditions, new developments in the financial markets in general and in financial market supervision in particular as well as of the OeNB's changing responsibilities and its role as an international partner in cooperation and dialogue. It also contains the OeNB's financial statements.

Intellectual Capital Report

annual

The Intellectual Capital Report is a review of the OeNB's intellectual capital and its use in the OeNB's business processes and services. The report clarifies the relationships between different types of human, relational, structural and innovation capital and describes various determinants that influence the OeNB's intellectual capital. The report provides an integrated view of the OeNB and serves to assess the consistency of the OeNB's intellectual capital with its knowledge-based strategic orientation.

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