FIW – Working Paper

FIW Working Paper N° 81
May 2012

Hemlock for policy response: Monetary policy, exchange rates and labour unions in SEE and CIS during the crisis

Branimir Jovanovic [1], Marjan Petreski [2]

Abstract

The objective of this paper is to assess whether the level of unionization and the rigidity of the exchange rate affected wages and monetary policy in SEE and CIS during the ongoing economic crisis. Towards that end, a New Keynesian model with price and wage rigidities is used. The model is estimated with a panel GMM over the period January 2002 – March 2011 on sample of 19 countries. Several findings emerge. First, the output gap is found not to depend on the real interest rate, in accordance with the underdeveloped financial markets in these economies. Second, inflation is found not to depend on the output gap, but on the wage gap, which stresses the relevance of the labour unions for the inflation dynamics in these countries. Third, the labour wedge that arises from the monopolistic competition in the labour market works mainly through the wage gap, not the output gap, in accordance with the high unemployment in these countries. Fourth, monetary policy responded counter-cyclically during the crisis in countries with weak trade unions, differently from countries with strong unions: in crisis times, weak economy drags wages down in low-unionized countries and monetary policy relaxes in these countries, both due to lower wages and due to the weaker economy; on the other hand, strong unions prevent a weak economy to drag wages down in crisis times and central banks in these countries are found not to react to economic activity, prices or wages. Fifth, the fixed exchange rate is found to restrain monetary policy in times of crisis, too – in countries with flexible exchange rates, monetary policy during the crisis responds to movements in output gap and reserves, in contrast to countries with fixed exchange rate, where monetary policy does not respond to any domestic macroeconomic variable.

JEL: E52, F0, F31, J51, P20
Keywords: monetary policy; fixed exchange rate; wage bargaining; unionization; SEE; CIS

Authors

[1]University of Rome "Tor Vergata", Italy, E-mail: branimir.jovanovic@uniroma2.it
[2]University American College Skopje, Macedonia,
E-mail: marjan.petreski@uacs.edu.mk.

Hemlock for policy response: Monetary policy, exchange rates and labour unions in SEE and CIS during the crisis

Branimir Jovanovic
University of Rome "Tor Vergata", Italy
branimir.jovanovic@uniroma2.it

Marjan Petreski
University American College Skopje, Macedonia
marjan.petreski@uacs.edu.mk

Abstract

The objective of this paper is to assess whether the level of unionization and the rigidity of the exchange rate affected wages and monetary policy in SEE and CIS during the ongoing economic crisis. Towards that end, a New Keynesian model with price and wage rigidities is used. The model is estimated with a panel GMM over the period January 2002 – March 2011 on sample of 19 countries. Several findings emerge. First, the output gap is found not to depend on the real interest rate, in accordance with the underdeveloped financial markets in these economies. Second, inflation is found not to depend on the output gap, but on the wage gap, which stresses the relevance of the labour unions for the inflation dynamics in these countries. Third, the labour wedge that arises from the monopolistic competition in the labour market works mainly through the wage gap, not the output gap, in accordance with the high unemployment in these countries. Fourth, monetary policy responded counter-cyclically during the crisis in countries with weak trade unions, differently from countries with strong unions: in crisis times, weak economy drags wages down in low-unionized countries and monetary policy relaxes in these countries, both due to lower wages and due to the weaker economy; on the other hand, strong unions prevent a weak economy to drag wages down in crisis times and central banks in these countries are found not to react to economic activity, prices or wages. Fifth, the fixed exchange rate is found to restrain monetary policy in times of crisis, too – in countries with flexible exchange rates, monetary policy during the crisis responds to movements in output gap and reserves, in contrast to countries with fixed exchange rate, where monetary policy does not respond to any domestic macroeconomic variable.

Keywords: monetary policy; fixed exchange rate; wage bargaining; unionization; SEE; CIS

JEL classification: E52, F0, F31, J51, P20

Acknowledgement: This research has been generously supported by a grant awarded by the Vienna Institute for International Economic Studies (wiiw) and the Global Development Network (GDN). The authors thank Vladimir Gligorov, Mario Holzner, Rustam Ibragimov, Michael Landesmann, Igor Velickovski, Goran Vuksic, Naida Trkic-Izmirlija, as well as participants on the international conference "20 years of transition in Central and Eastern Europe" at the Corvinus University in Budapest, Hungary, for very helpful comments. All remaining errors are solely of the authors.

1. Introduction

Different regions in the world faced the recent economic crisis differently and followed different ways of recovery. The aggregate data suggest that in 2007 (the last pre-crisis year), the countries of the Commonwealth of Independent States (CIS) and South-Eastern Europe (SEE) were growing at high rates and faster than other regions in the world. Crisis effects were then severely felt by CIS and SEE in 2009, but these countries also recovered very rapidly in 2010. The differences in the cross-countries growth rates during and after the crisis are, to some part, a reflection of how the authorities responded to the crisis. Many of the countries in SEE and CIS utilized the standard policy response by increasing public spending. When monetary policy in concerned, however, many of those countries remain trapped to buffer a shock by the fixed currency. Five of the countries maintain a de facto fixed exchange rate, including complete euroisation (Montenegro) and tough currency boards (Bulgaria and Bosnia and Herzegovina), while eleven countries of CIS and SEE have a form of very limited flexibility (conventional peg, de facto) which limits the space for independent monetary policy. On the other hand, Romania and Serbia manage the exchange rate, while Turkey is a de-facto free floater (Ilzetzki, Reinhart and Rogoff, 2008, see Table 1). After bad experiences in the early periods of hyperinflation, pegging of the local currency to the Euro seemed natural for transition economies and emerged as a social consensus in many of them. However, as pegged currency leaves no manoeuvre room for monetary policy, the response to the crisis in these countries rested on interest-rate soaring in order to defend the currency and to prevent large fall in the official reserves. Consequently, peggers featured less pronounced interest-rate decline in 2009, compared to the non-peggers, since the latter could have adjusted their nominal exchange rate, to a certain extent, to act as a buffer against the crisis. Thus, monetary policy exerted only a limited effect in restraining further deepening of the 2009 recession and in stimulating recovery.

On the other hand, wage adjustments, as a vehicle to absorb shocks, probably exerted even more limited effect in these countries. Namely, real wages did not decline in the major part of CIS and SEE countries, in accordance with the still high level of unionisation in these countries (43% of the workers in SEE and CIS are members of labour unions, compared to 26% in the EU; see Table 1). Therefore, it would be interesting to assess whether wages acted like shock absorbers or shock generators during the crisis in these countries.

The objective of this paper is to analyse monetary-policy and wage responses in SEE and CIS during[1] the recent economic crisis in a unified quantitative framework. In doing so, the research aims to disentangle how the rigidity of the exchange rate and the degree of unionization in those countries potentially affected the monetary policy conduct. To achieve this objective, the paper utilizes an augmented version of the New Keynesian model, with embedded price and wage rigidities, whereby the monetary policymaker faces trade-offs in stabilizing wage inflation, price inflation and the output gap. The model

[1] We will use the wording "during the crisis" not "after the crisis" for the period 2009-2011, despite the fact that most of the analysed economies actually recovered in 2010, simply because it is difficult to argue that the global crisis is over.

allows for bridging the level of labour unionization with the labour wedge arising from monopolistic competition in the labour market and its implication for the wage growth. In addition, exchange rate and official reserves enter the monetary policy function to capture the potential source of restraint that these might entail in countries with fixed exchange rate. Panel GMM technique is used to estimate the model for 19 SEE and CIS countries over the period January 2002 - March 2011 (one business cycle).

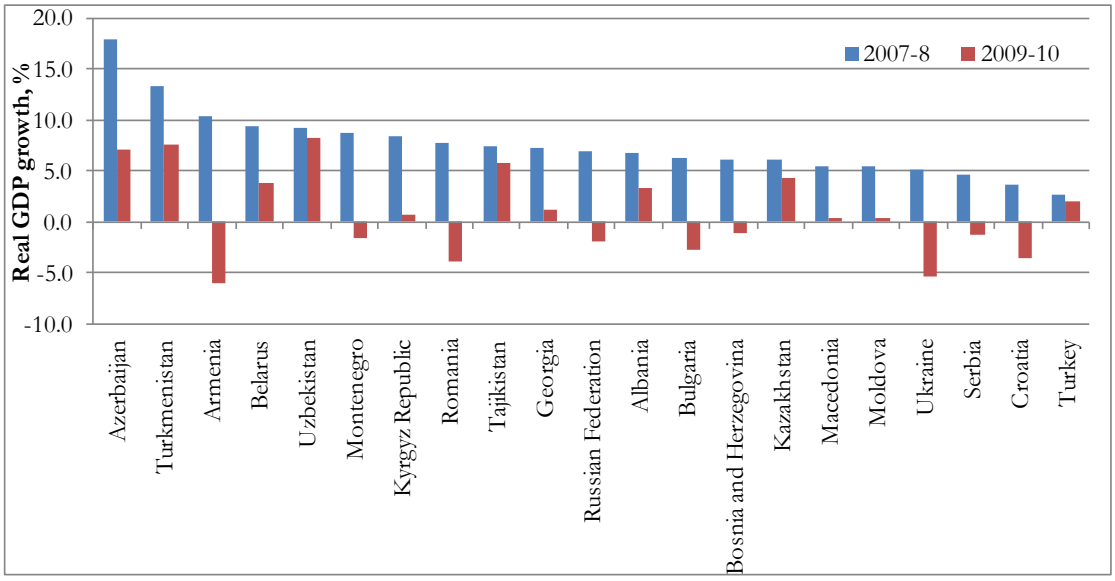
Several interesting findings emerge from the analysis. First, the output gap is found not to depend on the real interest rate, in accordance with the low level of development of the financial markets in these economies. Second, inflation is found not to depend on the output gap, but on the wage gap, which points out that labour unions may be more important for the inflation dynamics in these countries, than the monetary authorities. Third, the market power that workers possess in setting their wages works itself out through the wage gap, not the output gap. In other words, workers try to bring their wages to the equilibrium level, irrespective of the business cycle, probably due to the high levels of unemployment in these countries. Fourth, monetary policy in countries with weak unions has supported the economy during the crisis, differently from countries with strong unions. Finally, monetary policy in countries with fixed exchange rate is found not to react to domestic economic developments during the crisis, in contrast to countries with flexible rate.

The rest of the paper is organized as follows: Section 2 presents some stylized facts about economic activity, monetary policy and wages in SEE and CIS countries. Section 3 reviews the associated literature. Section 4 portrays the theoretical models used. Section 5 explains the data and methodology used. Section 6 presents the data and offers some discussion. Section 7 concludes.

2. Some stylized facts

Different countries from SEE and CIS were growing at different rates before the global economic crisis hit in late-2008. Then, when the crisis came, different countries were affected in a different way. GDP growth in the 21 SEE and CIS countries before (2007-2008) and during the crisis (2009-2010) is shown on Figure 1.

Figure 1 – GDP growth in SEE and CIS countries before and during the crisis

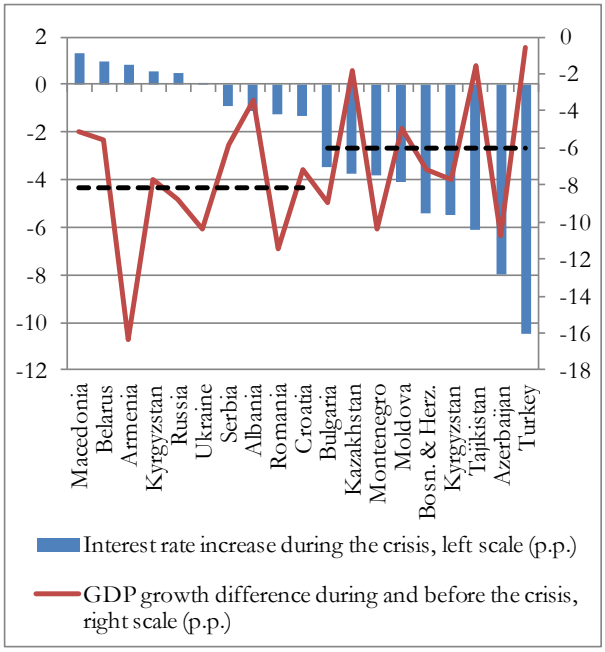


Countries are ordered according to the average GDP growth for 2007 and 2008, from highest to lowest.
Source: IMF's International Financial Statistics

Many factors help explain why different countries performed differently during the crisis (see, e.g. Blanchard et al. 2010 and the references therein), so the present study will not assess the relative merit of different factors. Nevertheless, one of the motivations for this study emerges from the observed correlation between the slowdown in the GDP growth during the crisis and the increase in the central bank's interest rate (Figure 2). It may be noticed that countries where monetary policy was more expansive (i.e. the interest rate of the central bank declined more) suffered less during the crisis (i.e. recorded lower decline in the GDP growth) – the average GDP-growth slowdown for the right-hand-side sub-sample on Figure 2, which had more expansionary monetary policy, was 6 percentage points, whereas for the left-hand-side sub-sample on the same figure, which had less supportive monetary policy, it was 8 percentage points.

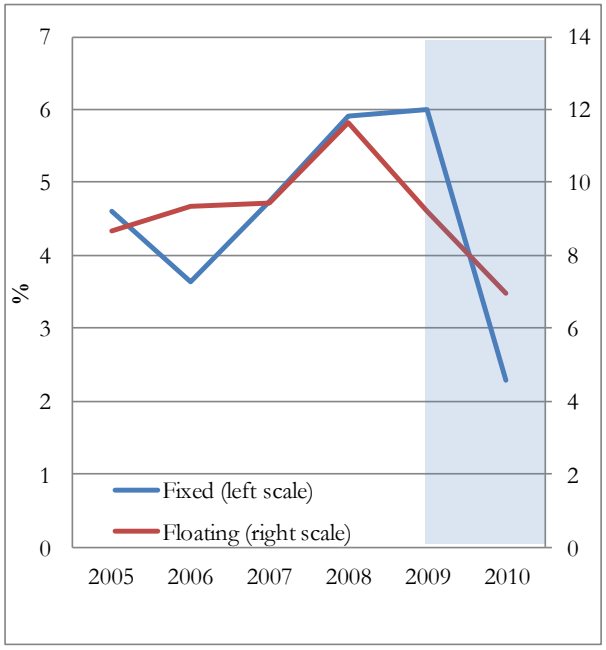
While this observation might not be unexpected, it might be worthwhile to analyse which factors have prevented monetary policy to be more expansive. This study aims to do so. It will focus on two important factors – the regime of the exchange rate and the degree of wage rigidity.

Figure 2 – GDP growth slowdown and interest rate increase during* the crisis



* refers to the average in 2009-2010 vs. average in 2007-2008.
Countries are ordered according to the interest rate increase during the crisis, from highest to lowest. Turkmenistan and Uzbekistan are excluded due to data unavailability.
The black dashed lines on the left figure are the averages of the GDP growth decline for the first and second half of the countries (Macedonia-Croatia and Bulgaria-Turkey).
Source: IMF's International Financial Statistics.

Figure 3 – Interest rates in SEE and CIS countries with fixed and floating exchange rates during the crisis**



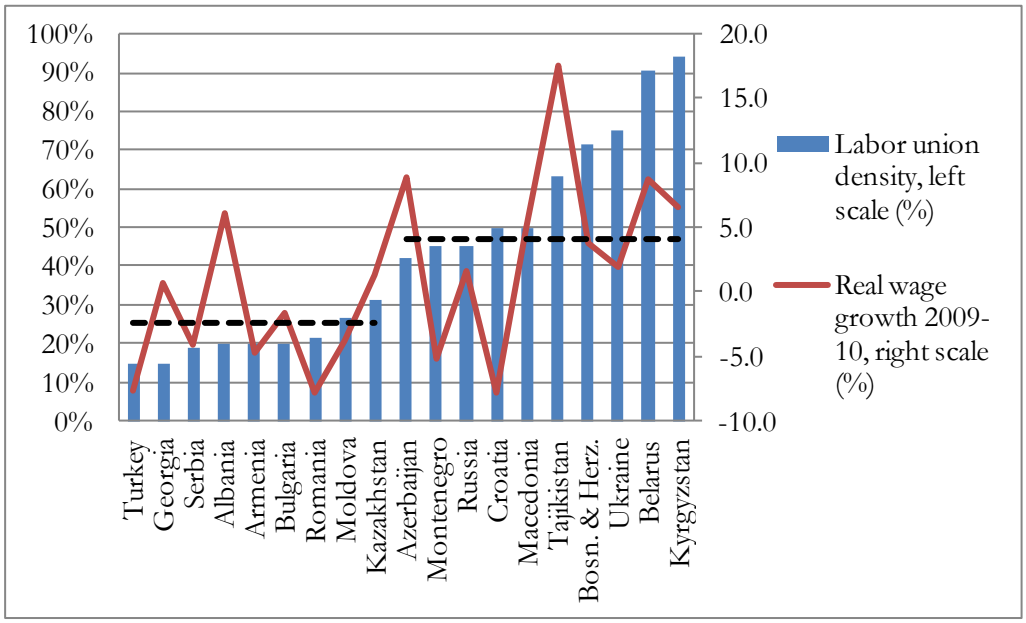
** Countries with fixed exchange rate are Bosnia and Herzegovina, Bulgaria, Croatia, Macedonia and Montenegro. All remaining SEE and CIS countries are classified as countries with floating exchange rate.
The reported figures are simple averages for the countries that belong to the respective groups.
The shaded area on the right figure shows the crisis period (2009 and 2010).
Source: IMF's International Financial Statistics.

Figure 3 shows the nominal central bank interest rates in SEE and CIS countries with fixed and flexible exchange rates. The constraining role of the peg is apparent – whereas countries with flexible exchange rate saw their interest rates declining when the crisis unfolded in 2009, interest rates in countries with fixed exchange rates actually rose in 2009, as a consequence of the efforts to defend the currency from devaluation. Subsequently, interest rate in countries with fixed regime fell more than in countries with flexible regime in 2010, but this is a time when most of these countries essentially started recovering from the crisis.

As for the degree of wage rigidity, it is interesting to observe the correlation between the real growth in wages during the crisis and the level of unionisation (Figure 4). Wages in countries with higher unionisation (right-hand-side sub-sample on Figure 4) rose in 2009 and 2010, by 4% on average, differently from wages in countries with lower unionisation (left-hand-side sub-sample on Figure 4), which fell by 2%, on average. This suggests that strong unions might act to prevent wages from falling during a crisis, which then has implications for how the crisis unfolds, i.e. that wage rigidity may be a shock generator in countries with strong labour unions, instead of being a shock absorber. Wage rigidity has implications for monetary policy, too - higher wages lead to higher inflation, and higher inflation requires higher interest rates. Hence, in times of crisis, when monetary policy should be expansionary in

order to support the real economy, higher wages might offset this effect, by pushing interest rates to rise in order to prevent inflation.

Figure 4 – Real wage growth during the crisis and level of unionisation



Countries are ordered according to the labour union density, from lowest to highest.
The black dashed lines are the averages of the real wage growth for the first and second half of the countries (Turkey-Moldova and Kazakhstan-Kyrgyzstan).
Source: *New Unionism Network Global Union Database* and authors' calculations based on IMF's International Financial Statistics

3. Literature overview

Monetary policy and wage bargaining in SEE and CIS have been little researched. The reason on the side of monetary policy may be the de-facto fixed currencies in these countries – the average value of the exchange rate rigidity for SEE and CIS is 2.1, which corresponds to a conventional peg in the Ilzetzki, Reinhart and Rogoff (2008) classification (see Table 1). This seemingly put the domestic policy on autopilot and it hence could not have been actively used for pursuing domestic objectives. The reason on the side of wage bargaining may be sought in the focus that these countries put on the relatively high unemployment, despite the high labour unionisation - the average unionisation rate for SEE and CIS is 43% (see Table 1), vs. 26% in the EU[2].

[2] The figure for the EU is from the Federation of European Employers.

Table 1 – De-facto exchange rate regimes and unionization rate in SEE and CIS

Country	Average rigidity of the exchange rate (2000-2010)*	Degree of unionization**
	SEE	
Albania	2.5	20%
Bosnia and Herzegovina	1.0	71%
Bulgaria	1.0	20%
Croatia	2.0	50%
Macedonia	1.1	50%
Montenegro	1.0	45%
Romania	3.0	21%
Serbia	3.0	19%
Turkey	3.9	15%
	CIS	
Armenia	2.4	20%
Azerbaijan	2.0	42%
Belarus	2.0	91%
Kyrgyz Republic	2.0	94%
Georgia	2.5	15%
Kazakhstan	2.0	31%
Moldova	2.0	27%
Russia	2.0	45%
Tajikistan	2.8	63%
Ukraine	1.0	75%
Average for all countries	***2.1***	***43%***
Notes: * Measure of de-facto exchange rate rigidity from Ilzetzki, Reinhart and Rogoff (2008): 1=complete euroization/currency board; 2=conventional peg; 3=managed float; 4=free float; **Labor union density (% of total salaried people)		

Source: Exchange rate rigidity - Ilzetzki, Reinhart and Rogoff (2008). Union density - New Unionism Network Global Union Database and other sources (see Appendix).

Some papers investigating monetary policy, exchange rates and wages in SEE and CIS include: Starr (2005), De Grauwe and Schnabl (2008), Keller and Richardson (2003), Korhonena and Wachtel (2006), Velickovski and Pugh (2011), Arandarenko (2004) and Pavlova and Rohozynsky (2005). Starr (2005) investigates if monetary policy has real effects in the four largest CIS countries – Russia, Ukraine, Belarus and Kazakhstan – and finds little evidence for that. The reasons for the non-existence of this channel are likely: the relative flexibility of prices and wages, thin credit markets, and the fact that domestic interest rates cannot be determined independently of world capital markets. De Grauwe and Schnabl (2008) analyse the relationship between exchange rates, inflation and growth in South-East and Central Europe and conclude that monetary policy with pegged currency is not an obstacle for growth. Quite the contrary, the study finds that this setup leads to increased trade and lower interest rates in the SEE region. Keller and Richardson (2003) argue that these countries manage their currencies heavily, i.e. frequently de facto peg their currency to prevent a large exchange-rate volatility to negatively affect the economy. In addition, Korhonena and Wachtel (2006) and Velickovski and Pugh (2011) document the high exchange-

rate pass-through to prices in these countries, which lends additional support that the observed smoothing of the exchange-rate fluctuations might be optimal. Arandarenko (2004) and Pavlova and Rohozynsky (2005), on the other hand, give an elaborative overview of the evolving labour market institutions and trade unions in SEE and CIS, respectively. The first review concludes that labour unions in SEE advanced, from institutions of Communist party control ('transmission mechanisms') and distributors of fringe benefits, to representatives of workers' economic interests. However, their bargaining power declined, both at the national and at the company level, especially in the private sector. The second review argues that the transformation of labour markets in CIS is incomplete and many problems remain, like the centralized wage setting, underemployment and ineffective systems of labour relations and social protection. Aside these two studies, to our knowledge, no study analyzes economic outcomes of the wage setting process and unionization level, let alone integrating monetary policy and wage bargaining impact on economic outcomes in a single quantitative framework.

In the world literature, the integration of monetary-policy responses and wage bargaining in a single quantitative framework has been also relatively new. The early paper to investigate implications of wage rigidities for monetary policy is Erceg, Henderson and Levin (2000), who find that targeting inflation only is suboptimal in the presence of wage rigidities. Giannoni and Woodford (2003) further extend their work, arguing that in some cases optimal monetary policy implies targeting a weighted average of price and wage inflation. Christiano, Eichenbaum and Evans (2005) conclude that wage rigidities are more important than price rigidities in explaining monetary effects on real economy. Smets and Wouters (2003, 2007) conclude that wage rigidities are very important drivers of the business cycle. Champagne and Kurmann (2010) find that the increase in wage volatility in the US is likely to be due to the decline in the unionization and the shift towards performance-pay contracts.

Given the new contributions in the world literature on the topic treated herein, and the lack of comparable research for SEE and CIS, we proceed with setting and estimating a model that will enable an integrated analysis of the monetary policy and wage bargaining in those countries.

4. Theoretical and empirical model

The New Keynesian model with price and wage rigidities has been originally developed by Erceg et al. (2000). This is a standard small New Keynesian model with infinite time periods, two types of agents in the economy – households and firms (and the central bank), and two markets – for labour and for goods. There is a continuum of households which consume consumption goods and offer differentiated labour to firms. They maximise the expected utility, which depends positively on the consumption and negatively on the hours worked. There is a continuum of firms which produce differentiated consumption goods, using identical production technology and one factor of production – labour, and maximise expected profits. Both labour and goods markets are monopolistically competitive (i.e., different labour/good types can substitute themselves, but only imperfectly), as a result of what households/firms can set the prices of

their labour/good types. They cannot change their prices every turn, though, as a result of what there is some stickiness in the price of labour/goods. The central bank sets the interest rate.

Maximisation of the agents' objective functions, log-linearizing the first-order conditions around the steady-state, and some additional algebraic manipulations, yield the following equations:

$$y_t = Ey_{t+1} - \frac{1}{\gamma}(i_t - E\pi^p_{t+1} - r^n_t) \quad (1)$$

$$\pi^p_t = \beta E\pi^p_{t+1} + \kappa_p y_t + \lambda_p w_t \quad (2)$$

$$\pi^w_t = \beta E\pi^w_{t+1} + \kappa_w y_t - \lambda_w w_t \quad (3)$$

The first equation is the IS curve, which defines the output gap (y_t) as a positive function of the expected output gap (Ey_t) and a negative function of the real interest-rate gap ($i_t - E\pi^p_{t+1} - r^n_t$). The intuitive explanation of this equation is that output will grow when agents expect output growth in the future and when the real interest rate is falling (because they will find it easier to borrow). The second equation is the price Philips curve, which defines price inflation (π^p_t) as a positive function of the expected price inflation ($E\pi^p_{t+1}$), the output gap and the real-wage gap (w_t). Therefore, price inflation today will be higher when expected future price inflation is higher and when the output and the wages are growing. The third equation, similarly, defines wage inflation (π^w_t) as a positive function of the expected wage inflation ($E\pi^w_{t+1}$) and the output gap, and a negative function of the real-wage gap. Intuitively, wage inflation will rise when future wage inflation is expected to increase, when the output is above the potential (because of the higher demand for labour), and when real wages are below the equilibrium (because wages will tend to return to the equilibrium level). The parameter γ denotes the coefficient of relative risk aversion, β is the discount factor, κ_p and κ_w are parameters showing how the output gap affects price and wage inflation, and λ_p and λ_w show how price and wage inflation depend on the real wage gap.

The model is closed by a monetary-policy rule, which describes the behaviour of the central bank. Though optimal monetary policy in this model depends on the value of the model parameters, as Giannoni and Woodford (2003), Woodford (2003) and Gali (2008) argue, the most desirable policy is the one that reacts to a weighted average of wage and price inflation. On the other hand, as Erceg et al. (2000) argue, the Taylor rule performs equally well (in terms of welfare losses) as the optimal monetary-policy rule in this model. Therefore, we will use a Taylor-type rule, in which monetary policy responds to price inflation, wage inflation and output gap. However, the sample of countries analyzed consists mostly of small and open economies, for which the external sector plays a vital role for the performance of the aggregate economy[3]. Because of this and the related macro-context in those economies (including the

[3] Even in the countries that might nor qualify as small economies, like Russia, Ukraine or Turkey, the external sector plays a prominent role in the economy.

degree of euroization and the high exchange-rate pass-through), the interest-rate rule will also include the nominal exchange rate, to capture the tendency to smooth fluctuations in the exchange rate. In addition, some of the countries in the sample have a pegged currency, which represents a constraint to the monetary policy. To capture this constraint, the monetary-policy rule will include the official reserves too, since insufficient reserves might preclude the central bank from targeting inflation or output in a situation when there are pressures on the exchange rate (see Jovanovic and Petreski, 2012 on this)[4]. Hence, the monetary-policy rule will be of the form:

$$i_t = \rho + \phi_p \pi_t^p + \phi_w \pi_t^w + \phi_y y_t + \phi_q ER_t - \phi_x res_t \qquad (4)$$

where i_t stands for the nominal interest rate, ER_t for the nominal exchange rate, res_t for the international reserves and the ϕ's are parameters that represent central bank's preferences.

5. Data and methodology

5.1. Data and variables

Monthly data are used since monetary decisions are usually made on a fortnightly frequency (see Clarida et al. 2000) and given the larger number of observations on disposal. The sample used in the analysis comprises 19 countries of SEE and CIS – Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Georgia, Kazakhstan, Kyrgyzstan, Macedonia, Moldova, Montenegro, Romania, Russia, Serbia, Tajikistan, Turkey and Ukraine. Kosovo, Turkmenistan and Uzbekistan are not included, due to unavailability of (quarterly) data. The time period analyzed is January 2002 - March 2011. The chosen 9-years period roughly coincides with one business cycle.

The database includes data on the reference interest rate of the monetary authority, the consumer price index, the industrial production (economic activity), average nominal wages in the economy, international reserves and the nominal exchange rate (against the dollar or the euro, depending on which currency is more important for the exports, see the Appendix; the exchange rate is defined so that increase stands for depreciation). The main data source is the International Financial Statistics (IFS) of the IMF. Industrial production data for many of the countries are from the United Nations Economic Commission for Europe (UNECE), while data on wages are mainly from the International Labour Organization (ILO). Data that were not available from these sources are obtained from the corresponding statistical offices or central banks (detailed list of sources is given in the Appendix).

All the series are rebased so that the average for 2007 is made equal to one. All data that exhibited seasonal patterns are seasonally adjusted (industrial production, wages, prices) using the Census X-12 method. Real wages are calculated by dividing nominal wages with the CPI index, while real interest rates by subtracting the annual inflation rate from the nominal interest rates. The gaps of the industrial

[4] Furthermore, reserves' movements contain important information for the external-sector developments, as well as for the whole economy, and monetary authorities observe data on foreign reserves in real time.

production, real interest rate, real wage, nominal exchange rate and reserves are obtained by the Hodrick-Prescott filter, smoothing factor 14400, following the suggestions of Backus and Kehoe (1992)[5]. All the variables are stationary, in accordance with the requirements of the GMM technique (unit root tests are not reported, but are available on request).

Expectations about the future values of the variables are proxied by the leads of the variables. The error terms in the estimated regressions justify this, since they capture (amongst other things) the differences between the leads of the variables and the true expectations of the agents, which, according to the rational expectation hypothesis, are white noise processes as agents do not make systematic errors[6]. In addition, some papers, like Brissimis and Magginas (2008), find no significant difference between using lead values versus responses from surveys or other types of forecasts, in the context of inflation.

Several dummies appear in the analysis, as well: for a fixed/flexible exchange rate, for low/high labour unionisation and for countries from South East Europe (SEE) versus the Commonwealth of Independent States (CIS). The classification from Ilzetzki, Reinhart and Rogoff (2008) is followed in order to decide which countries have fixed exchange rate. However, two small changes are made with respect to their classification – Ukraine was set to have a flexible exchange rate, instead of fixed, while Croatia was set as fixed instead of flexible. These two changes have been made on the grounds of the observed movements of the rates of the two currencies[7]. Hence, five countries in the dataset have fixed exchange rate – Bosnia and Herzegovina, Bulgaria, Croatia, Macedonia and Montenegro. The data on labour union membership density from the New Unionism Network is used to classify countries into lowly versus highly unionised, where countries with density below 40% are treated as lowly unionised (Albania, Armenia, Bulgaria, Georgia, Kazakhstan, Moldova, Romania, Serbia, Turkey) and the rest as highly unionised. The 40% treshold is chosen arbitrarily, as a round number which splits the sample of countries into two roughly equal groups. Finally, the dummy for SEE takes value of one for Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Macedonia, Montenegro, Romania, Serbia and Turkey and zero for Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russia, Tajikistan and Ukraine.

In order to assess the differences in the policy response before the crisis versus during/after the crisis, two sub-samples are used: January 2002 – December 2008 and January 2009 –March 2011. The breakpoint has been determined based on two tests for structural break in the economic activity (industrial production) series. In the first, the log of the economic activity has been regressed on a constant, trend, seasonal dummies and three dummies for the structural break – one for the shock (taking

[5] They suggest the following rule for choosing the smoothing factor: factor = 1600*(number of periods in the year/4)^2. For monthly data, this yields 14400.

[6] Note that there are no error terms in the theretical model (equations 1-4). The error terms appear only in the model that is estimated, due to measurement errors, omitted variables etc.

[7] Ukrainian hryvnia devalued several times during the crisis, which means the exchange rate during the crisis was de facto flexible, not fixed. On the other hand, Croatian kuna, against the euro, fluctuated only negligibly in 2002-2011, between 7.1 and 7.7 kuna/EUR, and only very little during the recent crisis.

unitary value in one month only), one for a level shift (taking unitary value for all the months after the shock), one for a change in the intercept (the level shift, multiplied by the trend). The structural break has been first set to January 2008, and then if all the three dummies were not negative, the structural break was set to the next month and so on. The first period when all three dummies appeared negative and jointly significant has been chosen as the breakpoint. In the second test, the same scheme has been used, only the regression included the output gap (gap of the industrial production) as a dependent variable and a constant, a shock and a level shift dummy. Both approached suggested January 2009 as the most likely breakpoint – the threshold after which the crisis took place.

5.2. Econometric methodology

A feature of the model described in Section 4 is the apparent endogeneity, emerging from the notion that the dependent variables affect some of the independent variables (i.e. simultaneity). Because of this, the four equations are estimated using the panel Generalized Method of Moments (GMM). This is a fixed-effects estimator which accounts for the present endogeneity in the model. Here, fixed effects are preferred to random effects a priori, as in all cross-country analyses, since differences between the countries cannot be claimed to be stochastic, i.e. the sample of countries cannot be considered to be random. Although the policy-rule equation features a lag of the dependent variable as one of the regressors, it is still estimated by standard GMM and not by dynamic panel methods (Arellano-Bond, Arellano-Bover or Blundell-Bond), since dynamic panel methods are appropriate for typical micro panels, with small time-series dimension. When the time dimension is large, as in our case (around 100 monthly points), the dynamic-panel bias that emerges from the lagged dependent variables vanishes (see Roodman, 2009), so there is no need for a dynamic-panel technique. Heterogenous-panels techniques (Pesaran and Smith, 1995, Pesaran, Shin, Smith, 1999), which allow for differences in coefficients between the cross sections, were not considered, since they do not account for endogeneity.

As usual when working with GMM, lags of the independent variables are used as instruments for their current values. Validity of instruments is assessed using four tests: the Hansen J test, where the null hypothesis is that the overidentifying restrictions are valid; the Kleibergen-Paap rk test, where the null is that the model is underidentified; the Cragg-Donald and the Kleibergen-Paap rk tests where the null is that the model is weakly identified (see Baum et al. 2007, Kleibergen and Paap, 2006, Kleibergen and Schaffer, 2007, Cragg and Donald, 1993). Normally, three lags of the explanatory variables are used as instruments. In the specifications in which some of the tests are violated, the instrument list is adjusted (either decrease or increase the number of lags) until the tests are satisfied.

In addition to the estimations for the whole sample of countries, the analysis is done by subsamples constructed on three criteria – the exchange rate regime, the geographical location and the level of unionisation as explained in section 5.1.

6. Results and discussion

In this section, we present estimates of the four equations of the New Keynesian model. Tables 1 to 4 present estimates of the reduced-form specifications of the model. Probabilities of the instruments tests are presented in the lower parts of the tables.

The New Keynesian IS curve is presented in Table 1. The coefficient on the expected output gap is not statistically different from the theoretical value of unity, albeit the point estimate of the coefficient is higher than one. Interestingly, the coefficient on the real interest rate gap is not statistically significant, which is quite robust finding. It might suggest that the monetary policy decisions are not transmitted onto real business cycle and can be explained by the underdeveloped financial markets in those countries and, in particular, as Gigineishvili (2011) suggests, by excess of banking liquidity that is a prominent characteristic of transition countries. The finding is consistent with Starr (2005) and Velickovski (2012), who find the same result for the four largest CIS countries and the six Western Balkan countries, respectively.

Table 1 – IS curve

Dep. var.: Output gap	**Base spec.**	**ER rigidity**		**Geography**		**Level of unionisation**	
		Fixed ER	**Flexible ER**	**SEE**	**CIS**	**High union**	**Low union**
Expected output gap	1.30***	1.11***	1.29***	1.07***	1.24***	1.26***	1.03***
Real interest rate gap	-0.31	-1.08	-0.33	-0.81	-0.56	-0.55	0.18
Observations	*1778*	*413*	*1365*	*829*	*959*	*865*	*932*
Number of cs	*19*	*5*	*14*	*9*	*10*	*9*	*10*
R-squared	*0.025*	*0.209*	*0.046*	*0.243*	*0.12*	*0.083*	*0.273*
Expected output gap=1 (p value)	0.05	0.37	0.10	0.49	0.07	0.04	0.78
Overidentification test (p value)	0.171	0.461	0.319	0.432	0.107	0.204	0.251
Underidentification test (p value)	0.000	0.002	0.000	0.000	0.000	0.000	0.000
CD weak identification test (F value)	39.89	18.33	29.88	38.29	47.84	45.16	52.22
KP weak identification test (F value)	8.18	9.029	6.385	8.718	11.84	10.52	8.271

Source: Authors' calculations
Notes:
The coefficient on the real interest rate gap is the long-run coefficient.
Heteroskedasticity and autocorrelation robust standard errors reported (*** p<0.01, ** p<0.05, * p<0.1)
The overidentification test is the Hansen J test. The null hypothesis is that the instruments **are not overidentified.**

The underidentification test is the Kleibergen-Paap test. The null hypothesis is that the instruments **are underidentified.**

The CD and KP weak identification tests are the Cragg-Donald and Kleibergen-Paap tests for weak identification. The null hypothesis is that the model is weakly identified. In cases where critical values were not available, as a rule of thumb, F values above 10 indicate that the null can be rejected (Staiger and Stock, 1997). Whenever the associated F-value falls below 10, the continuously updating GMM estimator is used, arguably providing standard errors robust to weak identification (Baum et al. 2007).

With respect to estimates of the New Keynesian Phillips curve (Table 2), the coefficient on expected inflation is statistically different from the conventional values of the discount factor (around 0.99). There are two plausible explanations for this. First, as we proxy expected inflation with the realized future inflation, discount factor higher than one might imply that the inflation expected by the economic agents is consistently above the realized inflation. This seems sensible for the investigated countries, which have experienced episodes of high inflation. Second, the estimated coefficient may include some other factors

as well, besides the discount factor, which can affect inflation but are not included in the model, like various supply-side shocks.

The coefficient on the marginal cost, represented by the output gap, is statistically insignificant, while the coefficient on the real wage gap is significant and suggests that prices increase by half percent when wages are above the trend by one percent. Note that this is the long-run coefficient, and as such it is in line with other studies' findings (Brissimis and Magginas, 2008). These findings point out that labour unions might have a strong role in the inflation-determination process in SEE and CIS, contrary to the monetary authorities, which seem to have a rather limited power. In addition, when the equation is estimated without the real wage gap in (so as to reduce to the basic Phillips curve), the output gap becomes significant (though, frequently at the 10% level only). This points out that, in essence, the output gap picks up the influence of the labour unions on prices and not the effect of the marginal cost. When results are analyzed through different sub-groupings, we observe that the effect of the wage-increase on prices disappears in the fixed exchange rate group. This can be explained by the much lower wage-inflation in this group of countries[8], which may be, at least to some extent, due to the curbing effect that the peg entails on inflation (see, e.g. Rogoff et al. 2004). Within the geographical and unionization sub-groupings, though, the difference between the coefficients on the real wage gap is apparent, but not statistically significant in both cases. However, in the low-union group, the coefficient on the marginal cost becomes significant, which may be attributed to the increased flexibility of prices in those countries (see, e.g. Starr, 2005): rising marginal costs quickly transmit onto prices and fuel inflation in addition to the push-up effect coming from the increasing wages.

[8] The average annual increase in the nominal wages in the countries with fixed exchange rate in the observed period is 6,6%, compared to the 21% in the countries with flexible exchange rate.

Table 2 – Price Phillips curve

Dep. var.: Annual (y-o-y) growth of CPI	Base spec.	ER rigidity		Geography		Level of unionisation	
		Fixed ER	Flexible ER	SEE	CIS	Low union	High union
Expected future inflation	1.10***	1.08***	1.10***	1.14***	1.06***	1.14***	1.06***
Output gap	0.12	0.13	0.11	0.13	0.19	0.24**	0.13
Real wage gap	0.55***	0.23	0.60***	0.29*	0.88**	0.33**	0.88**
Observations	*1734*	*442*	*1292*	*862*	*863*	*846*	*878*
Number of cs	*19*	*5*	*14*	*9*	*10*	*10*	*9*
R-squared	*0.942*	*0.902*	*0.945*	*0.949*	*0.929*	*0.943*	*0.93*
Expected future inflation=0.99 (p val.)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Overidentification test (p value)	0.504	0.959	0.494	0.197	0.770	0.073	0.677
Underidentification test (p value)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
CD weak identification test (F value)	246.3	30.89	195.8	57.83	129.2	72.63	102.1
KP weak identification test (F value)	38.19	17.58	29.65	9.997	35.23	11.86	28.15

Source: Authors' calculations
Notes:
The coefficients on the output gap and the real wage gap are the long-run coefficients.
Heteroskedasticity and autocorrelation robust standard errors reported (*** p<0.01, ** p<0.05, * p<0.1)
The overidentification test is the Hansen J test. The null hypothesis is that the instruments **are not overidentified.**
The underidentification test is the Kleibergen-Paap test. The null hypothesis is that the instruments **are underidentified.**

The CD and KP weak identification tests are the Cragg-Donald and Kleibergen-Paap tests for weak identification. The null hypothesis is that the model is weakly identified. In cases where critical values were not available, as a rule of thumb, F values above 10 indicate that the null can be rejected (Staiger and Stock, 1997). Whenever the associated F-value falls below 10, the continuously updating GMM estimator is used, arguably providing standard errors robust to weak identification (Baum et al. 2007).

The next two estimated equations are the primary focus of this paper. Table 3 gives the estimates of the wage inflation equation, which is helpful in disentangling the potentially different effects in the investigated countries, depending on the level of labour unionization therein. Again, in all specifications, the coefficient on the future wage inflation is higher than plausible theoretical values for the discount factor, for the same reasons as in equation 2. The output gap is insignificant at conventional levels, in accordance with the high unemployment in these countries. In contrast, real wage gap has explanatory power over wage growth in the majority of cases, suggesting that the labour wedge that arises from the monopolistic competition in the labour market, works mainly through the wage gap, not the output gap. If the actual wage is below equilibrium, then there is a pressure for closing the gap, i.e. for increasing the wage, and vice versa. Not surprisingly, the coefficient is not significant in the high-union group, suggesting that strong unions prevent the wage from falling when it is above equilibrium. Moreover, the coefficient is insignificant in the peggers' group, which, similarly to the price-inflation equation, might be a consequence of the lower wage-inflation in these countries, but may also be due to the fact that most of the peggers have at the same time strong unions (the average unionisation in the group of peggers is 47%, while in the floaters, it is 41%).

When the level of unionization and the crisis period are cross-analyzed, some interesting findings arise. Crisis drags wages down in low-unionized countries, as observed by the significant coefficient on the output gap after the crisis. One-percent drop of output below the trend pulls wages down by a cumulative magnitude of about 2.5 percent, which is not surprising: the average wage growth in the low-union sub-

sample before the crisis has been 19%, then falling down to 7% after the crisis spread. In such circumstances, weak unions cannot press for wage reverting to equilibrium. The coefficient on the real wage gap becomes insignificant after the crisis, suggesting that the wage drop cannot be combat due to the weak unions. The picture is different in the high-union group. Strong unions not only prevent wage from falling and reaching equilibrium in good times, but they also prevent a weak economy to drag wages down (the coefficient on the output gap after the crisis remains insignificant). The average wage growth in high-union countries fell from 19% before to about 12% after the crisis, which is yet considerably smaller drop than in the low-union group and supports our findings.

Table 3 – Wage Phillips curve

		ER rigidity		Geography		Level of unionisation	
Dep. var.: Annual (y-o-y) growth of wage	**Base spec.**	**Fixed ER**	**Flexible ER**	**SEE**	**CIS**	**Low union before/after crisis**	**High union before/after crisis**
Expected future wage growth	1.05***	1.11***	1.05***	1.06***	1.02***	1.16***	1.03***
Output gap	0.46	1.10	0.17	0.80	-1.37	-0.58	-0.33
Real wage gap	-4.07***	-2.04	-4.23***	-5.47***	-9.84*	-3.75***	5.19
Output gap after the crisis						2.94***	3.04
Real wage gap after the crisis						2.40	-6.07
Observations	*1730*	*439*	*1290*	*870*	*852*	*855*	*867*
Number of cs	*19*	*5*	*14*	*9*	*10*	*10*	*9*
R-squared	*0.767*	*0.677*	*0.774*	*0.841*	*0.697*	*0.853*	*0.649*
Expected future wage growth=1 (p value)	0.00	0.11	0.01	0.04	0.30	0.00	0.83
Overidentification test (p value)	0.749	0.992	0.776	0.112	0.222	0.805	0.825
Underidentification test (p value)	0.000	0.000	0.000	0.000	0.000	0.009	0.000
CD weak identification test (F val.)	247.1	36.98	190	75.70	81.46	55.81	15.211
KP weak identification test (F val.)	52.75	26.26	37.61	7.573	32.61	3.593	2.895

Source: Authors' calculations

Notes:
The coefficients on the output gap and the real wage gap are the long-run coefficients.
Heteroskedasticity and autocorrelation robust standard errors reported (*** p<0.01, ** p<0.05, * p<0.1)
The overidentification test is the Hansen J test. The null hypothesis is that the instruments **are not overidentified.**

The underidentification test is the Kleibergen-Paap test. The null hypothesis is that the instruments **are underidentified.**

The CD and KP weak identification tests are the Cragg-Donald and Kleibergen-Paap tests for weak identification. The null hypothesis is that the model is weakly identified. In cases where critical values were not available, as a rule of thumb, F values above 10 indicate that the null can be rejected (Staiger and Stock, 1997). Whenever the associated F-value falls below 10, the continuously updating GMM estimator is used, arguably providing standard errors robust to weak identification (Baum et al. 2007).

The equation that closes the New Keynesian model is the monetary rule, whose estimates are given in Table 4. We estimate the rule with the current values of the independent variables only, for simplicity purposes. However, if lagged inflation or lagged output or any combination of those affects current inflation and/or output, which was the original idea of Taylor (1993) idea, then our rule nests it. Note that, in contrast to our theoretical model (4) in section 3, the estimated coefficients herein are central-bank responses to the different variables included in the model. These include central-bank preferences in the policymaking, but their separation is beyond the scope of this study. The results of the baseline

specification suggest that the central banks investigated here conducted monetary policy by observing only past interest rate, as suggested by the high and significant smoothing parameter (column 1). Other coefficients did not even approach to the conventional significance levels. Similar conclusion can be reached by sub-grouping the countries by the geographic criterion (columns 6 and 7).

However, the sample includes countries with different level of exchange-rate rigidity, which might be crucial for how the central bank responds to the developments in the economy. In the group of fixers, including when they are observed before versus after the crisis (columns 2 and 3), the conclusion remains the same as for the baseline case. This is not surprising, though, given that a fixed regime puts domestic policy on complete autopilot if capital mobility is high – in such cases, due to the impossible trinity (Obstfeld *et al.* 2005), the central bank cannot focus on domestic objectives with simultaneous commitment to sustain the peg. Contrary to expectations, though, the pegging central bank does not respond to reserves' movements either, given their role in these economies for defending the peg. However, their insignificance in the pegging group might also suggest that any pressures in those countries on the foreign exchange market (say, due to capital flow cease during crisis) have been successfully resisted by managing the interest rate.

Reserves appear important within the sub-sample of countries with flexible exchange rate (column 4), on the other hand. Column 5 suggests that their significance is entirely derived from the crisis period, when a percentage decrease of reserves led to interest rate increase, to prevent excess exchange rate volatility, of about 1.6%, on average. More importantly, these countries seemed to have supported real economy during the crisis – the output gap coefficient during the crisis (given by the sum of the coefficients in front of the output gap before and after the crisis) is positive and significant at 10%. This is a notable difference with respect to the findings obtained from the sample of peggers.

Important findings and differences in responses appear when the unionization sub-grouping is observed. In the low-union sub-group, inflation and output gap significantly affect the monetary policy conduct. However, the picture is apparently blurred, given the vivid findings obtained by observing the sample before versus after the crisis (column 9). Before the crisis, inflation and wage growth appear significant at the 10% level, with the sign in front of wage unexpectedly negative. While this may be simply due to an imprecise estimation, because of the high correlation between the wage and price inflation, it can also be because of the high negative coefficient of the wage gap in the wage inflation equation. Namely, when unions are weak, positive wage gap is rapidly closed. This knowledge is then taken into consideration by the central bank, so that rising wages in good times are not considered as being a threat for the monetary policy conduct and the policy can relax even if wages show some growth. However, this completely changes after crisis. Inflation looses significance, while the cumulative response to wage growth turns positive (though insignificant). Since weak unions are not capable of preventing wage-decline during crisis (Table 3), the positive coefficient implies relaxation of monetary policy as a fight against the potential recession. This is further supported by the appearing significance on the output gap in column 9.

Turning to the discussion about the monetary policy responses when unions are strong (columns 10 and 11), we note insignificance of all variables at conventional levels. Recall that we found that strong unions do not prevent wage from falling and reaching equilibrium in good times, but they do not also allow a weak economy to drag wages down. However, the central bank does not react to price or wage movements in either case - a surprising, but robust finding, which points out to the absence of the wages-interest rate channel in times of crisis under strong labour unions, as compared to weak unions (recall that the interest rate falls in times of crisis due to the fall in the wages in countries with weak unions).

Table 4 – Monetary rule

Dep. var.: Base interest rate gap	Base spec.	ER rigidity				Geography		Level of unionization			
		Fixed	Fixed before/after crisis	Flexible	Flexible before/after crisis	SEE	CIS	Low union	Low union before/after crisis	High union	High union before/after crisis
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Lagged interest rate gap	0.92***	0.92***	0.97***	0.89***	0.97***	0.92***	0.94***	0.89***	0.90***	0.93***	0.93***
Price inflation	0.08	-4.41	-7.26	0.27	0.46	-0.47	0.77	0.12*	0.17*	0.06	-0.42
Wage inflarion	0.04	4.07	6.03	-0.04	-0.50	0.22	-0.17	-0.01	-0.08*	0.24	1.09
Output gap	-0.41	-1.91	-3.94	-0.27	0.39	0.00	-0.53	0.21**	0.09	-0.88	-1.86
Nominal ER gap	-0.25			-0.30	-0.96	0.72	-0.52	0.08	0.23**	-0.58	-1.38
Reserves gap	-0.04	0.59	1.03	-0.05**	-0.15	0.10	-0.06	-0.03	0.01	-0.03	-0.06
Price inflation after crisis			8.94		-1.85				-0.35		2.53
Wage inflation after crisis			-3.43		-1.08				0.20*		-0.55
Output gap after crisis			3.14		7.81*				0.45**		2.86
Nominal ER gap after crisis					3.85				-0.32		1.21
Reserves gap after crisis			-0.71		-1.62*				-0.07		0.12
Observations	*1524*	*401*	*401*	*1124*	*1116*	*827*	*703*	*743*	*743*	*781*	*784*
Number of cs	*18*	*5*	*5*	*13*	*13*	*9*	*9*	*9*	*9*	*9*	*9*
R-squared	*0.721*	*0.721*	*0.726*	*0.704*	*0.673*	*0.741*	*0.702*	*0.826*	*0.828*	*0.718*	*0.715*
Overidentification test (p val.)	0.403	0.778	0.511	0.529	0.666	0.734	0.429	0.391	0.361	0.593	0.399
Underidentification test (p val.)	0.000	0.000	0.000	0.000	0.029	0.000	0.000	0.000	0.018	0.000	0.000
CD weak identification test (F val.)	111.6	21.36	6.033	93.26	10.31	64.32	59.96	51.76	25.83	51.51	32.02
KP weak identification test (F val.)	15.85	15.41	3.329	11.99	2.402	9.029	10.86	8.466	3.777	12.39	12.29

Source: Authors' calculations

Notes:
The coefficients on the price inflation, wage inflation, output gap, nominal exchange rate and the reserves gap are the long-run coefficients.
Heteroskedasticity and autocorrelation robust standard errors reported (*** p<0.01, ** p<0.05, * p<0.1)
The overidentification test is the Hansen J test. The null hypothesis is that the instruments **are not overidentified.**

The underidentification test is the Kleibergen-Paap test. The null hypothesis is that the instruments **are underidentified.**

The CD and KP weak identification tests are the Cragg-Donald and Kleibergen-Paap tests for weak identification. The null hypothesis is that the model is weakly identified. In cases where critical values were not available, as a rule of thumb, F values above 10 indicate that the null can be rejected (Staiger and Stock, 1997). Whenever the associated F-value falls below 10, the continuously updating GMM estimator is used, arguably providing standard errors robust to weak identification (Baum et al. 2007).

To summarize, the results from the econometric analysis indicate that monetary policy in countries with fixed exchange rate and strong unions has not responded counter-cyclically during the recent crisis, in contrast to countries with flexible exchange rate and weak trade unions.

Several policy implications emerge from the analysis. The finding that changes in the real interest rate do not channel to prices through domestic demand may point out that monetary policy in these countries has very limited role to play for inflation. Contrary to the belief that this may be due to the fixed currency, the finding applies to all cases irrespective of the exchange-rate regime in operation. It may be justified by the still underdeveloped financial markets or the excess banking liquidity in these countries, which do not allow for full transmission of monetary policy, but also by to the high degree of economic openness. In addition, the finding that price inflation in SEE and CIS is driven mainly by wages, not economic activity, sheds an important light for fighting episodes of rising prices - by negotiations with the labour unions or by controls of public sector wages. Furthermore, the paper provided some indications that wage rigidity may constrain the central bank in conducting monetary policy, which suggests that policymakers may be interested in reducing these rigidities (through better cooperation with labour unions, for instance), so that future shocks (either to the GDP and to the inflation) are managed better. This may become very relevant, as many of these countries may go through (or are already going through) the Balassa-Samuelson process. Finally, this points out the importance of the exchange rate regime in these countries. In addition to our finding that the fixed exchange rate constrains the authorities from supporting the economy in times of negative demand shocks, exchange rate flexibility can be important in another way, too - in expansive cycle, when strong unions may prevent wages from falling, generating inflation, flexible exchange rate may help absorb these shocks and cool off the economy, by exchange rate appreciation. Certainly, these recommendations for the wage-rigidity and the exchange-rate regime are only one piece of the puzzle about the appropriate exchange-rate regime and the optimal degree of unionisation.

7. Conclusion

The objective of this paper is to assess whether the level of unionization and the rigidity of the exchange rate affected wages and monetary policy in SEE and CIS during the ongoing economic crisis. To achieve the objective, the paper employs a New Keynesian model with embedded price and wage rigidities. In addition, the monetary rule includes the exchange rate and the foreign exchange reserves in order to capture their restraining role for the monetary policy conduct in countries with fixed exchange rate. The model is estimated with a panel GMM over the period January 2002 – March 2011.

The first group of results idicates that output gap is not affected by the interest rate in SEE and CIS, which we attribute to the low level of development of the financial markets in these countries. This finding questions the role of the monetary policy in these economies. Similarly, the price inflation in SEE and CIS seems to depend more on the wages, not on the output gap, which points out that labour unions may be more imprtant for the innflation in these countries than the central banks.

The second group of results suggests that real wage gap has explanatory power over wage growth in the majority of cases, suggesting that the labour wedge that arises from the monopolistic competition in the labour market, works mainly through the wage gap, not the output gap. The coefficient is not significant in the high-union group, suggesting that strong unions prevent the wage from falling when it is above equilibrium. Results further suggest that crisis drags wages down in low-unionized countries: weak unions cannot press for wage reverting to equilibrium. The coefficient on the real wage gap becomes insignificant after the crisis, suggesting that the wage drop cannot be combat due to the weak unions. On the other hand, strong unions not only prevent wage from falling and reaching equilibrium in good times, but they also prevent a weak economy to drag wages down.

The third group of results suggests that central banks in countries with pegged currency and strong trade unions do not react to any of the policy variables, irrespective of whether the economy is in crisis or not, which can be interpreted as a constraint that strong unions and fixed exchange rate put on the monetary policy. Regarding the fixed exchange rate, this is not surprising, given that a pegged currency puts domestic policy on complete autopilot if capital mobility is high. Contrary to initial expectations, reserves appear important within the flexible exchange rate group and their significance is entirely derived from the crisis period, when these countries likely intervened on the foreign exchange market to prevent excessive exchange rate volatility (i.e. depreciation), but also seemed to have supported real economy during the crisis. When unionization is considered, results suggest that the rapid closure of the wage gap under weak unions is taken into consideration by the central bank, so that rising wages in good times are not considered as a threat for the monetary policy conduct and the policy can relax even if wages show some growth. In crisis, since weak unions are not capable of preventing wage-decline during crisis, monetary policy relaxes as a fight against the potential recession. On the contrary, under strong unions, central bank is found not react to price or wage movements, which points out to the absence of the wages-interest rate channel in countries with strong labour unions, as compared to countries with weak unions, in times of crisis.

References

[1] Arandarenko, M. (2004) International Advice and Labour Market Institutions in South-East Europe. *Global Social Policy*, 4(1), p.27-53.

[2] Backus, David K. and Patrick J. Kehoe (1992) International Evidence on the Historical Properties of Business Cycles, *The American Economic Review*, Vol. 82, No. 4 Sep., 1992), pp. 864-888

[3] Baum, C. F., Schaffer, M. E. and Stillman, S. (2007) Enhanced Routines for Instrumental variables/GMM estimation and testing. Working Paper, 667, Boston College Department of Economics.

[4] Blanchard, Olivier J., Mitali Das & Hamid Faruqee. (2010) The Initial Impact of the Crisis on Emerging Market Countries, Brookings Papers on Economic Activity, Economic Studies Program, The Brookings Institution, vol. 41(1 (Spring), pages 263-323.

[5] Brissimis, S. N. and Magginas, N.S. (2008) Inflation Forecasts and the New Keynesian Phillips Curve. *International Journal of Central Banking*, p.1-22.

[6] Christiano, L.J., Eichenbaum, M. and Evans, C.L. (2005) Nominal Rigidities and the Dynamic Effects of a Shock to Monetary Policy. *Journal of Political Economy*, 113(1), p.1-45.

[7] Clarida, R., Galí, J. and Gertler, M. (2000) Monetary Policy Rule and Macroeconomic Stability: Evidence and Some Theory. *Quarterly Journal of Economics*, 115(1), 147-80.

[8] Cragg, J. G., and S. G. Donald (1993). Testing identifiability and specification in instrumental variables models. *Econometric Theory* 9: 222–240.

[9] De Grauwe, P. and Schnabl, G. (2008) Exchange Rate Stability, Inflation, and Growth in (South) Eastern and Central Europe. *Review of Development Economics*, 12(3), p.530–549.

[10] Dixit, A.K. and Stiglitz, J.E. (1977) Monopolistic Competition and. Optimum Product Diversity. *American Economic Review*, 67, p.297-308.

[11] Erceg, C.J., Henderson, D.W. and Levin, A.T. (2000) Optimal Monetary Policy with Staggered Wage and Price Contracts. *Journal of Monetary Economics*, 46(2), p.281-314.

[12] Gali, J. (2008) *Monetary Policy, Inflation, and the Business Cycle: An Introduction to the New Keynesian Framework*. Princeton University Press.

[13] Giannoni, M.P. and Woodford, M. (2003) Optimal Inflation Targeting Rules, in B. Bernanke and M. Woodford, eds. The Inflation Targeting Debate, Chicago, Chicago University Press. (also NBER WP#9939).

[14] Gigineishvili N (2011) Determinants of Interest Rate Pass-Through: Do Macroeconomic Conditions and Financial Market Structure Matter? IMF working paper No. 11/176.

[15] Hansen, L. (1982) Large sample properties of generalized method of moments estimators. *Econometrica*, 50(3), p.1029-1054.

[16] Ilzetzki, E.O., C.M. Reinhart and K. Rogoff, (2008) Exchange Rate Arrangements into the 21st Century: Will the Anchor Currency Hold? Cambridge, MA: Harvard University, manuscript.

[17] Jovanovic, Branimir and Marjan Petreski (2012) Monetary Policy in a Small Open Economy with Fixed Exchange Rate: The Case of Macedonia. *Economic Systems*, forthcoming

[18] Judson, R. A. and Owen, A. L. (1996) Estimating Dynamic Panel Data Models: A Guide for Macroeconomics. *Economics Letters*, 65, p.9-15.

[19] Keller, P.M. and Richardson, T. (2003) Nominal anchors in the CIS. *IMF Working paper*, No. 03/179.

[20] Kleibergen, F., and M. Schaffer. 2007. RANKTEST: Stata module to testing the rank of a matrix using the Kleibergen-Paap rk statistic. Available at: http://ideas.repec.org/c/boc/bocode/s456865.html.

[21] Kleibergen, F., and R. Paap. 2006. Generalized reduced rank tests using the singular value decomposition. *Journal of Econometrics,* 127(1): 97–126.

[22] Korhonena, I. and Wachtel, P. (2006) A note on exchange rate pass-through in CIS countries. *Research in International Business and Finance*, 20(2), p.215-226

[23] Obstfeld, Maurice, Jay C. Shambaugh & Alan M. Taylor (2005). "The Trilemma in History: Tradeoffs Among Exchange Rates, Monetary Policies, and Capital Mobility", *The Review of Economics and Statistics*, 87(3), p.423-438.

[24] Pavlova, O. and Rohozynsky, O. (2005) Labor Markets in CIS Countries. *Studies & Analysis No.* 311.

[25] Pesaran, M. H., Y. Shin, and R. P. Smith (1999). "Pooled mean group estimation of dynamic heterogeneous panels". Journal of the American Statistical Association 94: 621-634.

[26] Pesaran, M. H., and R. P. Smith (1995). "Estimating long-run relationships from dynamic heterogeneous panels". Journal of Econometrics 68: 79-113.

[27] Rogoff, K.S., Husain, A.M., Mody, A., Robin, B. and Oomes, N. (2004) Evolution and Performance of Exchange Rate Regimes. *IMF Occassional paper*, 229.

[28] Roodman, David (2009) How to do xtabond2: An introduction to difference and system GMM in Stata, *The Stata Journal*, 9, Number 1, pp. 86–136.

[29] Smets, F. and Wouters, R. (2003) An Estimated Dynamic Stochastic General Equilibrium Model of the Euro Area. *Journal of the European Economic Association*, 1(5), p.1123-1175.

[30] Smets, F. and Wouters, R. (2007) Shocks and Frictions in US Business Cycles: A Bayesian DSGE Approach. *American Economic Review*, 97(3), p.586-606.

[31] Staiger, D. and Stock, J.H. (1997) Instrumental Variables Regression with Weak Instruments. *Econometrica*, 65(3), p. 557-586.

[32] Starr, Martha A. (2005) Does money matter in the CIS? Effects of monetary policy on output and prices, *Journal of Comparative Economics 33 (2005)*, pp. 441–461

[33] UN Human Rights Committee (2005) Consideration of reports submitted by States parties under article 40 of the Covenant: International Covenant on Civil and Political Rights: initial report: Bosnia and Herzegovina, 24 November 2005, CCPR/C/BIH/1, available at: http://www.unhcr.org/refworld/docid/4537779a0.html

[34] Velickovski, Igor (2012) Assessing independent monetary policy in small, open and euroized countries: evidence from Western Balkan, *Empirical Economics*, forthcoming

[35] Velickovski, Igor & Geoffrey Thomas Pugh (2011) Constraints on exchange rate flexibility in transition economies: a meta-regression analysis of exchange rate pass-through, *Applied Economics*, Taylor and Francis Journals, vol. 43(27), pages 4111-4125.

[36] Woodford, M. (2003) *Interest and Prices: Foundations of a Theory of Monetary Policy*. Princeton University Press.

[37] Wooldridge, J.M. (2001) *Econometric Analysis of Cross Section and Panel Data*. The MIT Press.

Appendix

Table A1 - Data sources

Data series	*Source*
Economic activity	Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Kazakhstan, Kyrgyzstan, Macedonia, Moldova, Montenegro, Romania, Russia, Serbia, Tajikistan, Turkey, Ukraine - monthly industrial production index from UNECE. Albania - until 2008, quarterly* sales index (the main index of economic activity in that time), after that, quarterly GDP, from the statistical office. Moldova - quarterly GDP from the statistical office.
Wages	Croatia, Macedonia, Kyrgyzstan, Kazakhstan - monthly wages for the whole economy, from IFS. Moldova, Romania - monthly wages in non-agriculture, from ILO. Armenia, Bulgaria, Montenegro, Ukraine - monthly wages in the manufacturing sector, ILO. Bosnia and Herzegovina - wages in non-agriculture until 2008-M10, manufacturing after that, from ILO. Belarus - monthly wages for the whole economy, from the central bank. Albania – quarterly* wages in the state sector, from the statistical office. Azerbaijan - monthly wages for the whole economy, from the central bank. Georgia - quarterly for the whole economy, from the statistical office. Russia - from the statistical office, until 2009 quarterly, after that - monthly. Serbia - monthly, whole economy, statistical office. Tajikistan - monthly, whole economy, statistical office. Turkey - total wage payments in manufacturing sector, quarterly, statistical office.
Interest rate	Bosnia and Herzegovina and Montenegro - reserve requirement rate, from the central bank. Kyrgyzstan - lombard rate, from IFS. All other countries - the reference interest rate of the central bank, from IFS. The interest rate for Bulgaria is the base interest rate, reported from the central bank, which is actually the interest rate on short-term government securities on the primary market until 2005, and the interbank money market rate later on.
Prices	All countries, except Montenegro - consumer price index from the IFS. Montenegro - constructed by the authors, from the monthly rates of inflation from the central bank.
Nominal exchange rate	Nominal exchange rate, national currency per euro or dollar (i.e. Increase = depreciation), from the IFS. For Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, Russia and Tajikistan - against the dollar, since commodities represent major part of their exports, or the US are the most important trading partner. For Belarus - against the Russian ruble, since more than 50% of their exports goes to Russia. For all other countries - against the euro.
International reserves	Foreign exchange reserves of the country, from the IFS. The currency in which they are expressed is the same as the currency against which the nominal exchange rate is quoted.
Trade Union Membership	Ukraine – Federation of European Employers (available on: http://www.fedee.com/labour-relations/trade-unions-in-europe/#Ukraine, last accessed on 23 April 2012). Bosnia and Herzegovina – UN Human Rights Commitee (2005). All other countries - New Unionism Network Global Union Database.

*in the cases where quarterly data are used, the same quarterly value is assumed for all the months in the quarter, without using any interpolation methods. While this may have some downsides, we believe this is closer to the way policymakers analyze data, since they rarely look at interpolated data.