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

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ABSTRACT

The objective of this paper is to assess how the level of unionisation and the rigidity of the exchange rate affects wages and monetary policy in South-East Europe and the Commonwealth of Independent States, with a particular focus on the recent economic crisis. Towards that end, a New Keynesian model with price and wage rigidities is used. Results suggest that fixed exchange rate and strong trade unions seem to constrain monetary policy in these countries, because monetary policy responded counter-cyclically during the crisis only in countries with weak trade unions and countries with flexbible exchange rate. Also, findings point out that trade unions may be more effective for controlling inflation in these countries that the monetary authorities.

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JEL classification: E52, F0, J51, P20

Keywords: monetary policy; fixed exchange rate; wages; unionisation; SEE; CIS; crisis

I. Introduction

Different regions in the world faced the recent economic crisis differently. The countries from the Commonwealth of Independent States (CIS) and South-Eastern Europe (SEE), which were growing faster than many other regions in the world before the crisis, were severely hit by the crisis in 2009, but also reversed to growth rapidly in 2010. Still, there are many differences in the growth records between different countries within this group, which are, to some extent, a reflection of how authorities responded to the crisis, and some of them may be limited in their ability to respond to negative shocks by the prevailing legal and institutional frameworks. Take, for instance, the monetary policy. The ability of the central bank to support the domestic economy during crises may be limited by the exchange rate regime - under fixed exchange rates, efforts of the central bank to support the domestic economy during crises, by lowering the interest rate, may result in capital outflows, and may jeopardise the chosen exchange rate regime, bringing more damage than benefit. Five of the SEE and CIS countries maintain a de facto fixed exchange rate, ten have a rather limited flexibility, and only Romania, Serbia, Tajikistan and Turkey can be classified as de-facto floaters. That the exchange-rate regime might have served as a constraint during the crisis can be seen from the notion that countries with fixed regimes actually increased their interest rates during the crisis, instead of decreasing them.

Constraints can emerge from other sources, as well, like wage rigidities. Wage rigidities can create inflationary pressures during crises, and may force central banks to increase the interest rate in order to fight the inflationary pressures, instead of decreasing it in order to support the domestic economic activity. That wages might have indeed served as shock-generators in SEE and CIS, instead of shock-absorbers during the crisis can be seen from the observation that real wages continued to grow during the crisis in eleven of the nineteen SEE and CIS countries. One source of such wage rigidities are - trade unions. SEE and CIS countries continue to have strong trade unions even today, twenty years after the break-up of the socialist system, where 41 percent of the workers are members of unions, compared to 26 percent in the EU.

The objective of this paper is to analyse the relationship between monetary policy, wages, exchange-rate regime and the real economy in SEE and CIS, particularly during the recent/ongoing economic crisis. In doing so, the research aims to disentangle how the rigidity of the exchange rate and the degree of unionisation in these countries potentially affected the monetary-policy conduct and the real economy. To achieve this objective, the paper will utilize a 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. Trade unions enter the model through the labour wedge, arising from monopolistic competition in the labour market, i.e. trade unions might affect the equilibrium-restoring mechanism in the wages dynamics. The exchange rate enters the model directly, as a term in the monetary policy function. Panel GMM technique will be used to estimate the model for 19 SEE and CIS countries over the period January 2002 - March 2011. The model will be estimated for different sub-groups of countries (SEE vs. CIS, fixed exchange rate vs. floating, strong vs. weak unions) and for different time periods (before the crisis vs. during the crisis) , and the conclusions will be based on these comparisons.

Several 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; since monetary policy affects inflation through the output gap, this points out that labour unions may be more important for inflation dynamics in these countries than monetary authorities. Third, wages depend on the wage gap, which incorporates the influence of the trade unions, but not on the output gap; the insensitiveness of the wages to the economic activity can be explained by the high level of unemployment in these countries, as a result of what the labour supply is high irrespective of the cycle. Fourth, monetary policy in countries with weak unions has supported the economy during the crisis, differently than in 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.

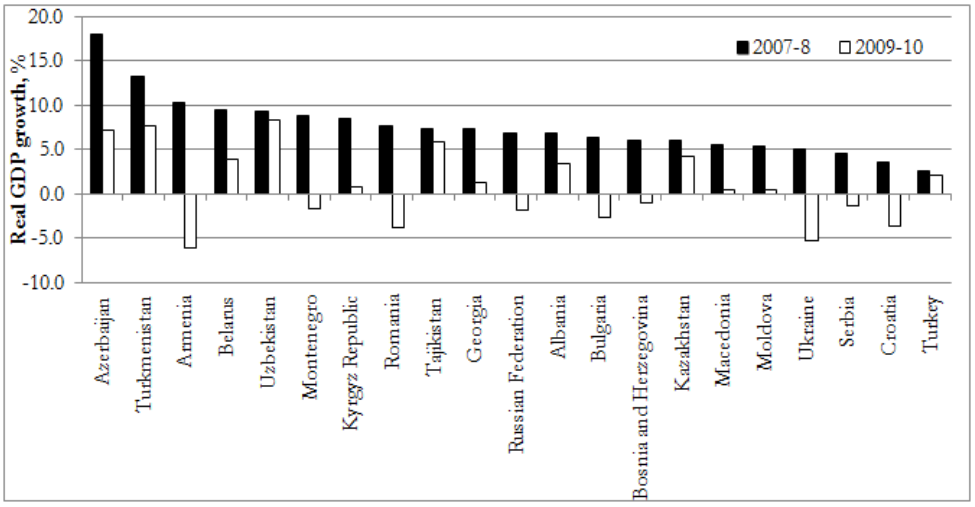
The rest of the paper is organized as follows. Section 2 presents some stylized facts about economic activity, monetary policy and wages in SEE and CIS countries, from which the constraining role of the fixed exchange rate and the strong unions can be guessed. Section 3 reviews the associated literature, suggesting that the issues the present paper addresses have remained largely

uninvestigated, especially in the literature on developing countries. Section 4 briefly portrays the theoretical model that will be used in the econometric analysis. Section 5 explains the data and the empirical methodology. Section 6 presents the econometric results, offers some explanations and discusses their policy implications. Section 7 summarises the analysis.

II. Some stylised facts

Different countries from SEE and CIS were growing at different rates before the global economic crisis hit in late 2008. Afterwards, different countries were affected in different ways. 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



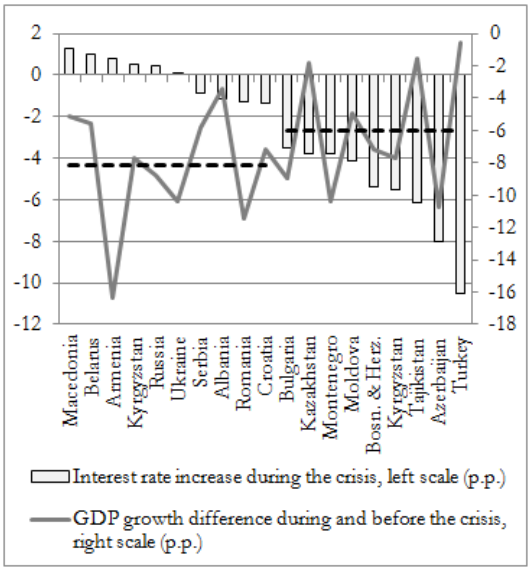
Source: IMF's International Financial Statistics. Countries are ordered according to the average GDP growth for 2007 and 2008, from highest to lowest. Turkmenistan and Uzbekistan are excluded due to data unavailability.

Many factors help explain why different countries performed differently during the crisis (see, for instance, Berglof et al. 2009, Blanchard et al. 2010, IMF, 2010, Crespo Cuaresma and Feldkircher, 2012), so the present study will not assess the relative merit of the 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 (that is, the interest rate of the central bank declined more) suffered less during the crisis (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 six percentage points, whereas for the left-hand-side sub-sample on the same figure, which had less supportive monetary policy, it was eight percentage points.

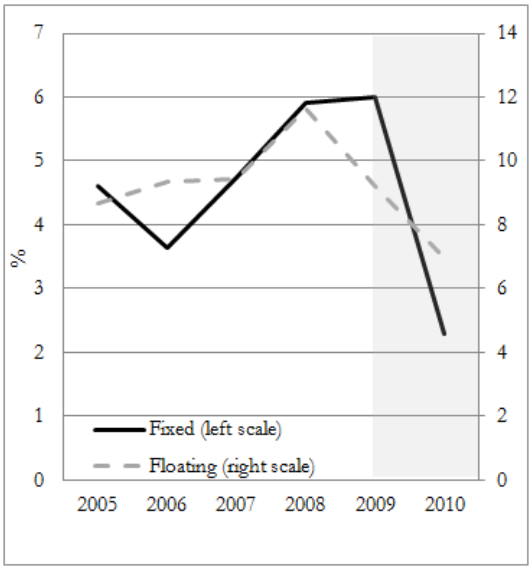
While this observation may be expected, it may be worthwhile to analyse which factors prevented monetary policy to be more expansive. This study aims to do so. It will focus on two important factors – the regime of the exchange rate and the degree of wage rigidity.

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. 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

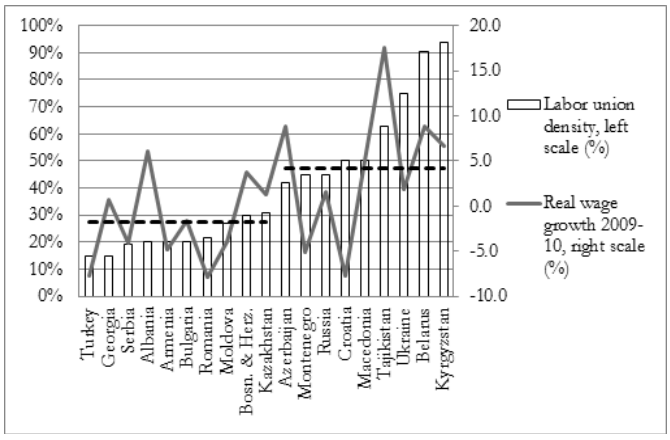


** Countries with fixed exchange rate are Bosnia and Herzegovina, Bulgaria, Croatia, Macedonia and Montenegro. All remaining SEE and CIS countries are classified as countries with floating exchange rate (see Section V.A for more details on this). The reported figures are simple averages for the countries 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 pressures.

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 four percent on average, differently from wages in countries with lower unionisation (left-hand-side sub-sample on Figure 4), which fell by two percent, 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. 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 up so as to prevent inflation. In other words, wages may be a shock generator in countries with strong labour unions, instead of being a shock absorber.

FIGURE 4: REAL WAGE GROWTH DURING THE CRISIS AND THE 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-Kazakhstan and Azerbaijan-Kyrgyzstan). Source: New Unionism Network Global Union Database and authors' calculations based on IMF's International Financial Statistics.

III. 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 strict exchange-rate regimes in these countries – the average value of the exchange rate rigidity for SEE and CIS is 2.1, which corresponds to a con-

ventional peg in the Ilzetzki, Reinhart and Rogoff (2008) classification (see Table 1). This may imply that monetary policy 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 41 percent (see Table 1), vs. 26 percent in the EU.[1]

1. The number for the EU is from the Federation of European Employers.

Table 1: De-facto exchange rate regimes and unionisation in SEE and CIS

Country	Average rigidity of the exchange rate (2000-2010)*	Degree of unionisation (in percent)**
	SEE	
Albania	2.5	20
Bosnia and Herzegovina	1	30
Bulgaria	1	20
Croatia	2	50
Macedonia	1.1	50
Montenegro	1	45
Romania	3	21
Serbia	3	19
Turkey	3.9	15
	CIS	
Armenia	2.4	20
Azerbaijan	2	42
Belarus	2	91
Kyrgyz Republic	2	94
Georgia	2.5	15
Kazakhstan	2	31
Moldova	2	27
Russia	2	45
Tajikistan	2.8	63
Ukraine	1	75
Average for all countries	**2.1**	**41**

Notes: * Measure of de-facto exchange rate rigidity from Ilzetzki, Reinhart and Rogoff (2008): 1=complete euroisation/currency board; 2=conventional peg; 3=managed float; 4=free float; **Labour union density (percent 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 for more details).

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, they 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 unionisation 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 unionisation 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.

IV. 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 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 (that is, 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:

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

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

$$\pi^w_t = \beta E\pi^w_{t+1} + \kappa_p y_t + \lambda_p w_t \quad (3)$$

$$\Delta w_t = \pi^w_t - \pi^p_t - \Delta w^n_t \quad (4)$$

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+1}) 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 (y_t) 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 (y_t), and a negative function of the real-wage gap (w_t). 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 last equation is just an identity which expresses the change in the real-wage gap (Δw_t) as a difference in the wage and price inflation ($\pi^w_t - \pi^p_t$) and the increase in the natural wage (Δw^n_t).

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.

Though the exact optimal monetary policy rule in this model depends on the value of the model parameters, as Giannoni and Woodford (2003), Woodford (2003) and Gali (2008) argue, optimal monetary policy in this model reacts to a weighted average of wage and price inflation. On the other hand, as Erceg et al. (2000) argue, the Taylor rule performs almost 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.[2] Because of this and the related macro-context in those economies (including the degree of euroisation 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, forthcoming, on this).[3] Hence, the monetary-policy rule will be of the form:

$$i_t = \rho + \phi_p \pi_t^p + \phi_w \pi_t^w + \phi_y y_t + \phi_q ER_t - \phi_x res_t \tag{5}$$

where i_t stands for the nominal interest rate, ER_t for the nominal exchange rate, res_t for the international reserves, π_t^p, π_t^w, and y_t are as previously defined (price inflation, wage inflation and output gap) and the $\phi's$ are parameters that represent central bank's preferences.

V. Data and methodology

V.A. Data and variables

Monthly data are used since monetary decisions are usually made on a fortnightly frequency (see Clarida et al. 2000) and since monthly data give more observations. The sample used in the analysis comprises 19 countries from 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. Turkmenistan and Uzbekistan are not included, mainly due to unavailability of data. The time period analyzed is January 2002

2. 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.

3. 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.

- March 2011. The chosen 9-years period roughly coincides with one business cycle and would enable comparison of policy responses during the crisis versus before the crisis.

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. Industrial production, real interest rate, real wage, nominal exchange rate and reserves enter the equations in their gap forms, since the original data are non-stationary. The gaps are obtained by the Hodrick-Prescott filter, smoothing factor 14400, following the suggestions of Backus and Kehoe (1992).[4] All the variables in the regressions 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.[5] 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.

4. 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.

5. 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 or omitted variables.

Several dummies appear in the analysis: 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, where countries with value of exchange rate rigidity below 2 are classified as countries with fixed currencies. We decided to treat currencies with rigidity of 2, which Ilzetzki, Reinhart and Rogoff (2008) name as "conventional peg", as flexible currencies, not fixed, as all these currencies actually depreciated (or were devalued) during the crisis. Exception is Croatia, whose currency fluctuated very little during the crisis, so it was kept as fixed. In addition, Ukraine was set to have a flexible exchange rate, despite the value of rigidity of 1, as its currency was devalued several times during the crisis. 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 percent are treated as lowly unionised (Albania, Armenia, Bosnia and Herzegovina, Bulgaria, Georgia, Kazakhstan, Moldova, Romania, Serbia, Turkey) and the rest as highly unionised. The 40-percent threshold is chosen arbitrarily, as a round number which splits the sample of countries into two roughly equal groups as no other guidance criterion was readily available. 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 the crisis, two sub-samples are used: January 2002 – December 2008 and January 2009 –March 2011. The breakpoint has been determined on the grounds of 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 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 approaches suggested January 2009 as the most likely breakpoint – the time peirod after which the crisis took place.

V.B. Econometric methodology

One feature of the model described in Section 4 is the endogeneity of the variables, emerging from the notion that the dependent variables affect some of the independent variables (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, that is, 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. Heterogeneous-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 rank test, where the null is that the model is underidentified; the Cragg-Donald and the Kleibergen-Paap rank 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). Usually, 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.

VI. Results, discussion and policy implications

VI.A. Results and discussion

In this section, we present estimates of the four equations of the model (equations 1-3 and equation 5).[6] The estimates are presented in Tables 2-5. The top parts of the tables report the regression coefficients, while the bottom parts report the tests of the vallidity of the instruments.

The New Keynesian IS curve is presented in Table 2. Two things should be noted. First, the coefficient on the expected output gap is not statistically different from the theoretical value of unity in most of the regressions, albeit the point estimate of the coefficient is higher than one. Second, the coefficient on the real interest rate gap is never statistically significant, which suggests that the monetary policy decisions are not transmitted onto real business cycle. The latter finding 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 (forthcoming), who find the same result for the four largest CIS countries and the six Western Balkan countries, respectively.

With respect to estimates of the New Keynesian price Phillips curve (Table 3), the first thing to note is that the coefficient on expected price 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. Because of all that, we do not consider the estimated coefficient on the expected

6. Equation 4 is an identity and should not be estimated. It relates the real wage gap to the wage and price inflation and is needed for simulations.

TABLE 2: IS CURVE

Dependent variable:	**Base spec.**	**ER rigidity**		**Geography**		**Level of unionisation**	
Output gap		Fixed ER	Flexible ER	SEE	CIS	Weak unions	Strong unions
Expected output gap	1.30***	1.11***	1.29***	1.07***	1.24***	1.07***	1.26***
Real interest rate gap	-0.31	-1.08	-0.33	-0.81	-0.56	-0.39	-0.55
Observations	1778	413	1365	829	959	942	865
Number of cs	19	5	14	9	10	10	9
R-squared	0.025	0.209	0.046	0.243	0.12	0.247	0.083
Expected output gap=1 (p value)	0.05	0.37	0.1	0.49	0.07	0.62	0.04
Overidentification test (p value)	0.171	0.461	0.319	0.432	0.107	0.184	0.204
Underidentification test (p value)	0	0.002	0	0	0	0	0
CD weak identification test (F value)	39.89	18.33	29.88	38.29	47.84	74.8	45.16
KP weak identification test (F value)	8.18	9.029	6.385	8.718	11.84	10.02	10.52

Source: Authors' calculations

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).

Table 3: Price Phillips curve

Dependent variable:	**Base spec.**	**ER rigidity**		**Geography**		**Level of unionisation**	
Annual (y-o-y) CPI growth		Fixed ER	Flexible ER	SEE	CIS	Weak unions	Strong unions
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	0	0	0	0	0	0
Overidentification test (p value)	0.504	0.959	0.494	0.197	0.77	0.073	0.677
Underidentification test (p value)	0	0	0	0	0	0	0
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

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).

inflation to be a sign of regression misspecification.

The coefficient on the output gap, which represents the marginal cost, is statistically insignificant almost always, which points out that monetary authorities in SEE and CIS might have a rather limited control over the inflation - they affect inflation through the output gap, and both the link between monetary policy and the output gap, and the link between the output gap and the inflation, are virtually non-existent in SEE and CIS. On the other hand, the coefficient on the real wage gap is significant and suggests that prices increase by approximately half percent when wages exceed their equilibrium level by one percent (note that this is the long-run coefficient, and as such it is in line with other studies' findings, like Brissimis and Magginas, 2008). This points out that labour unions might have relatively strong role in the inflation-determination process in SEE and CIS, through the wage controls.[7]

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 Rogoff et al. 2004). The coefficient on the real wage gap seems lower in SEE than in CIS, and in countries with weak unions than in countries with strong unions, but these differences are not statistically significant. However, in the weak-unions group, the coefficient on the output gap becomes significant, which may be attributed to the increased flexibility of prices in those countries (see Starr, 2005).

The next two estimated equations are the primary focus of this paper. Table 4 gives the estimates of the wage inflation equation. Again, in all specifications, the coefficient on the future wage inflation is higher than the plausible theoretical values for the discount factor, for the same reasons as in equation 2. The output gap is insignificant, which points out that wages do not depend on economic activity in SEE and CIS, which might not be strange, given the high unemployment in these countries, i.e. the high supply of labour. In contrast, real wage gap has explanatory power over wage growth in the majority of cases, suggesting that the labour wedge arising from the monopolistic competition in the labour market works mainly through the wage gap, not the

7. When the equation is estimated without the real wage gap (so as to reduce to the basic Phillips curve), the output gap becomes significant (though, frequently at the 10 percent level only). This points out that in that case the output gap picks up the influence of the labour unions on prices and not the effect of the marginal cost.

8. The average annual increase in the nominal wages in the countries with fixed exchange rate in the observed period is 6.6 percent, compared to the 21 percent in the countries with flexible exchange rate.

output gap - if the actual wage is below equilibrium, then there is a pressure for closing the gap, that is, for increasing the wage, and vice versa. Not surprisingly, the coefficient is not significant in the strong-unions 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 percent, while in the floaters, it is 41 percent).

When the level of unionisation and the crisis period are cross-analyzed, some interesting findings arise. Crisis drags wages down in the weak-unions countries, as observed by the significant and positive coefficient on the output gap during the crisis (the output gap becomes negative during the crisis, so it leads to a fall in the wages, because its coefficient in the regression is positive). 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 percent, then falling down to 7 percent 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 during the crisis, suggesting that the mechanism that drives wages to their equilibrium level is not operational during the crisis, i.e. that the fall in the wages below the equilibrium cannot be offset by the weak unions. The picture is different in the strong-unions group. The output gap and the real-wage gap are significant in these countries both before and during the crisis, but with opposing signs. The output gap has a positive sign before the crisis, implying that wages grow when the economy grows, but becomes negative during the crisis when the output gap becomes negative, pointing out that wages continue to grow even in such times, due to the strong unions. Similarly, the real-wage gap is negative before the crisis, indicating that wages start to fall when they are too high, but becomes positive during the crisis, pointing out that then wages continue to grow, even if they are above their equlibrium levels, due to the strong unions. This is evident from the figures on wage growrh in highly-unionised countries before and during the crisis - the average growth of wages fell from 19 percent before the crisis to about 12 percent during the crisis, which is considerably smaller drop than in the low-union group.

The equation that closes the New Keynesian model is the monetary rule, whose estimates

Table 4: Wage Phillips Curve

Dependent variable:	**Base spec.**	**ER rigidity**		**Geography**		**Level of unionisation**	
Annual (y-o-y) wage growth		Fixed ER	Flexible ER	SEE	CIS	Weak unions before/during crisis	Strong unions before/during crisis
Expected wage growth	1.05***	1.11***	1.05***	1.06***	1.02***	1.16***	0.80***
Output gap	0.46	1.1	0.17	0.8	-1.37	-0.58	3.3***
Real wage gap	-4.07***	-2.04	-4.23***	-5.47***	-9.84*	-3.75***	-6.1*
Output gap during the crisis						2.94***	-6.2**
Real wage gap during crisis						2.4	16***
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 wage growth=1 (p value)	0	0.11	0.01	0.04	0.3	0	0.03
Overidentification test (p value)	0.749	0.992	0.776	0.112	0.222	0.805	0.04
Underidentification test (p value)	0	0	0	0	0	0.009	0.02
CD weak identif. test (F value)	247.1	36.98	190	75.7	81.46	55.81	1.9
KP weak identif. test (F value)	52.75	26.26	37.61	7.573	32.61	3.593	1.7

Source: Authors' calculations

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).

are given in Table 5. We estimate the rule with the current values of the independent variables only. 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 represent both central-bank *preferences* in the policymaking and other factors that might have affected their decisions; the distinction between the two 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 during 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 percent, on average. More importantly, these countries seemed to have supported real economy during the crisis – the output gap coefficient during the crisis is positive and significant at 10 percent. This is a notable difference with respect to the findings obtained from the sample of peggers.

Interesting findings are obtained when the unionisation sub-grouping is observed. In the low-union sub-group, inflation and output gap significantly affect the monetary policy conduct, with

TABLE 5: MONETARY POLICY RULE

Dependent variable: Interest rate gap	**Base spec.**	**Exchange Rate rigidity**				**Geography**		**Level of unionisation**			
	-1-	**-2-**	**-3-**	**-4-**	**-5-**	**-6-**	**-7-**	**-8-**	**-9-**	**-10-**	**-11-**
		Fixed	Fixed before/during crisis	Flexible	Flexible before/during crisis	SEE	CIS	Low union	Low union before/during crisis	High union	High union before/during crisis
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 inflation	0.04	4.07	6.03	-0.04	-0.5	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	-0.53	0.21**	0.09	-0.88	-1.86
Nominal ER gap	-0.25			-0.3	-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	0.1	-0.06	-0.03	0.01	-0.03	-0.06
Price inflation during crisis			8.94		-1.85				-0.35		2.53
Wage inflation during crisis			-3.43		-1.08				0.20*		-0.55
Output gap during crisis			3.14		7.81*				0.45**		2.86
Nom. ER gap during crisis					3.85				-0.32		1.21
Reserves gap during 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
Overidentif. 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
Underident. test (p val)	0	0	0	0	0.029	0	0	0	0.018	0	0
CD weak ident. 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 ident. 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

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).

important differences before and during the crisis (column 9). Before the crisis, inflation and wage growth appear significant at the 10 percent 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, a 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 during crisis. Inflation loses significance, while the cumulative response to wage growth turns positive (though insignificant). Since weak unions are not capable of preventing wage-decline during crisis (see Table 4), 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 wages from falling and reaching equilibrium in good times, but they do not allow a weak economy to drag wages down. However, the central bank does not react to price or wage movements in either case, 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).

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.

VI.B. Dynamic responses of the model to shocks in the variables

Figures A1 – A5 in the Appendix show the dynamic responses of the model to shocks to the endogenous variables. Only the responses for the model consisted of the equations estimated for the sample of countries with weak unions are shown, to preserve space and to give intuition. Similar impulse responses are calculated for all the other groups of countries and are available on request.

Several things can be noticed from these figures. First, all the dynamic responses seem to

be in accordance with the expectations (more detailed discussion of the responses is left for the Appendix). Second, effects of shocks seem to be moderately persistent - most of the responses 'fade out' after 30-40 periods (roughly, 3 years, since we operate with monthly data). Third, there appears to be some overshooting in the wage and price inflation, driven by the real wage gap. These cyclical movements in the price and wage inflation are explained by the fact that the real wage gap has opposite effect on the price and wage inflation (recall, positive real wage gap raises price inflation, but brings wage inflation down), and that both the wage and price inflation affect the real wage gap, as well. These dynamics fade-out and do not lead to departures from the steady-state.

VI.C. Policy implications

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 from supporting the economy in times of crises, 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 in these countries. This is particularly so for the exchange rate flexibility, as these countries have fairly high exchange rate pass-through, due to the high openness (see Velickovski and Pugh, 2011), which points out that flexibilisation of the exchange rate might have adverse effects on the inflation in these countries. Also, the euroisation of households' liabilities is very high in many of the SEE and CIS countries (see Beckmann et al. 2011), which implies that more flexible exchange rate regime might have negative balance-sheet effects, i.e. exchange rate depreciation will increase households' debt servicing burden, which might then hurt real economy.

VII. Conclusion

The objective of this paper is to analyse the relationship between monetary-policy conduct, exchange-rate regime, labour unions and the real economy in SEE and CIS, and to assess whether the level of unionisation and the rigidity of the exchange rate constrained policy response in these countries during the ongoing economic crisis. To achieve the objective, the paper employs a New Keynesian model with embedded price and wage rigidities. The model is estimated with a panel GMM over the period January 2002 – March 2011.

The first group of results indicates 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 important for the inflation 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, differently from the output gap, pointing out that trade unions are more important for the dynamics in wages in these countries than real economic activity, which might be explained by the relatively high unemployment in these countries. Results further suggest that crisis drags wages down in low-unionized countries: the output gap coefficient becomes significantly positive during the crisis. In addition, the coefficient on the real wage gap becomes insignificant

during the crisis, implying that weak unions cannot press for wages reverting to equilibrium. On the other hand, strong unions prevent a weak economy to drag wages down (the coefficient on the output gap becomes negative and significant during the crisis in countries with strong unions, which points out that wages continue to grow despite the negative output gap, and the coefficient on the real-wage gap becomes positive and significatn, suggesting that wages continue to grow, even if they are above the equilibrium level).

The third group of results suggests that central banks in countries with pegged currency or strong trade unions do not react to any of the policy variables, which can be interpreted as a constraint that strong unions and fixed exchange rate put on the monetary policy (since the monetary policy cannot support the domestic economy). On the other hand, monetary policy in countries with flexible exchange rate or weak unions seemed to have supported real economy during the crisis - the output gap coefficient is significantly positive in the regressions during the crisis.

The overall analysis would seem to suggest that controlling wages, either by negotiations with labour unions or by controls of public sector wages, is likely to be more effective for curtailing inflation in SEE and CIS than restrictive monetary policy. The analysis also points out that flexibilisation of the exchange rate is likely to give more space to the monetary authorities in SEE and CIS to support their economies during crises, though the last reccommendation should be weighted against the potential costs of the more flexible exchange rates, which might be high in many of these countries, given their high euroisation and openness.

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VIII. Appendix

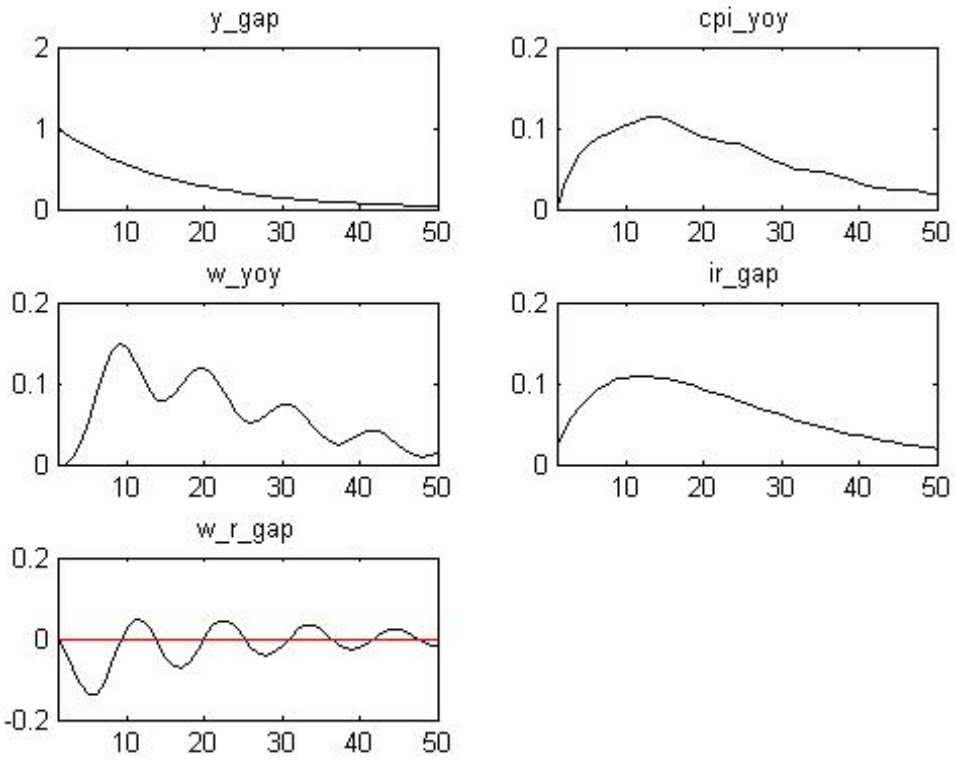
Table A1: Data sources

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 percent 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	In order to have as consistent data as possible, data on union membership were taken from the New Unionism Network Global Union Database, which provides data on all but two countries from the analysis (all other sources provided data on fewer countries). Ukrainian data are from the Federation of European Employers (available on: http://www.fedee.com/labour-relations/trade-unions-in-europe/Ukraine, last accessed on 23 April 2012), while data on Bosnia and Herzegovina are from Eurofound (2012).

*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.

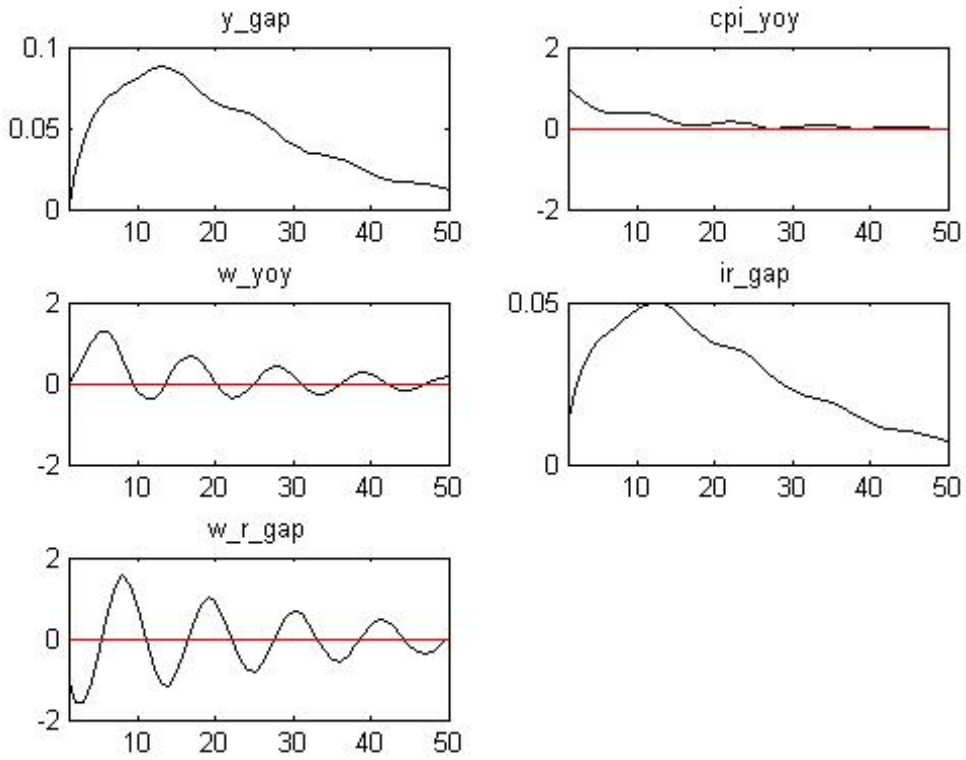
FIGURE A1: DYNAMIC RESPONSES TO A SHOCK IN THE OUTPUT GAP[9]



Positive shock to the output gap lasts for two to three years. It produces a rather-small hump-shaped response of the price and wage inflation and the interest rate.

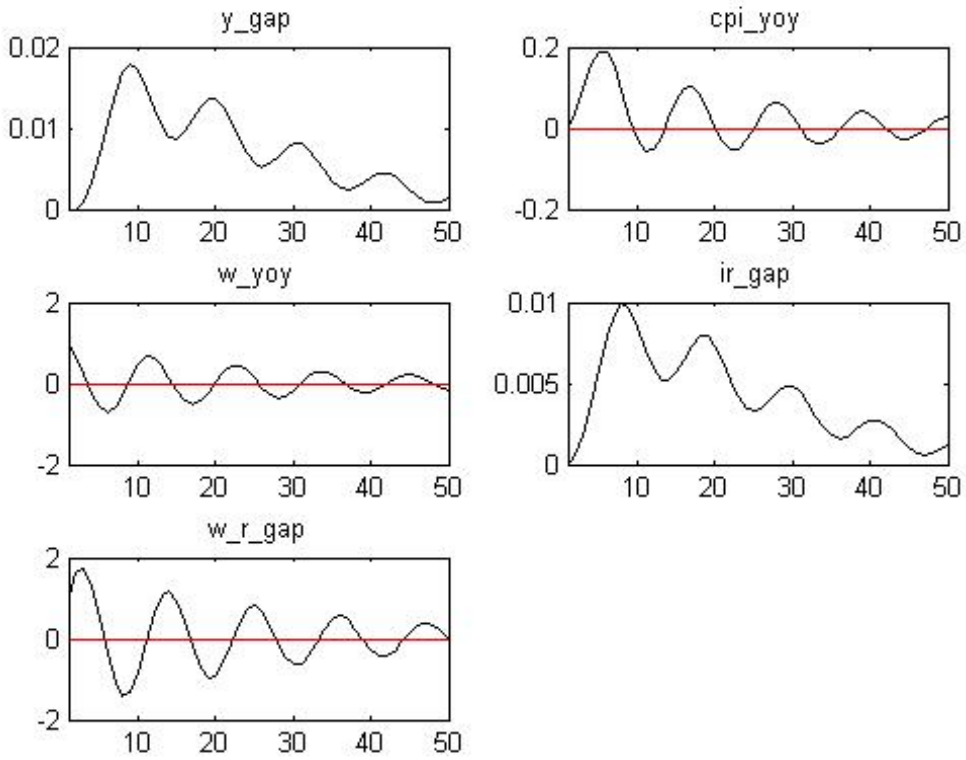
9. In these figures, y_gap stands for the output gap, cpi_yoy is the annual price inflation, w_yoy is the wage inflation, ir_gap is the nominal interest rate gap, and w_r_gap is the real wage gap.

Figure A2: Dynamic responses to a shock in the price inflation



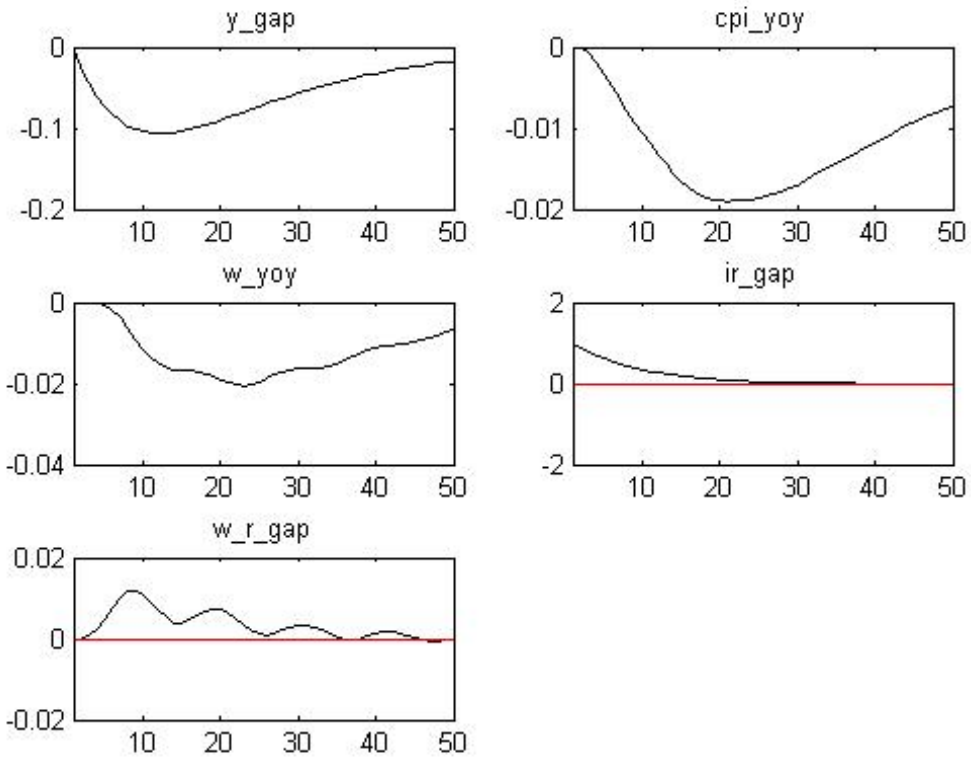
Positive shock to the price inflation leads to an increase in the nominal interest rate, but as the increase in the latter is smaller than the increase in inflation, the real interest rate falls. Consequently, the output gap rises. Both the interest rate and the output gap responses are rather small and dissipate in three years. The initial response of the wage inflation is stronger and positive. As the wage-inflation rise is still smaller than the price inflation, the real wage gap becomes negative, pushing wages up. Rising wages then lead to an increase in the wage gap, which causes wage inflation to fall. This circular causation continues for some time, leading to a cyclical dynamics in the wage inflation and the real wage gap. It gradually becomes weaker and eventually fades out.

Figure A3: Dynamic responses to a shock in the wage inflation



Positive shock to the wage inflation leads to a smaller increase in the price inflation, as a result of what the real wage gap becomes positive. The positive real wage gap then pushes wage inflation down, and price inflation up. This mechanism results in cyclical movements in the wage and price inflation and the real wage gap. The cyclicality fades out completely in roughly three to four years. As a result, the nominal interest rate reacts positively, but since its increase is smaller than the increase in the price inflation, the real interest rate falls, as a result of what the output gap becomes positive.

Figure A4: Dynamic responses to a shock in the interest rate



Positive interest rate shock fades out in less than two years. It produces a negative hump-shaped reaction in the output gap, with a much smaller magnitude. The negative output gap then produces a negative response of the price and wage inflation, which are fairly small.