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ANALYSIS OF THE NEGATIVE AND POSITIVE IMPACT OF INSTITUTIONAL FACTORS ON UNEMPLOYMENT IN VISEGRAD COUNTRIES

Abstract:

The objective of our analysis is to associate V4 Member States indicators with the selected institutional factors of the labour market. In addition, it aims at extending the Sekhon's standard model for inflation with institutional factors. For the purposes of estimating the NAIRU in V4 countries, we intend to use the Kalman filter method with a higher than common smoothing coefficient. The model's data will produce a specific period in which the institutional factors actually have a negative effect or positive effect onto the unemployment rate in individual countries. Finally, the analysis of the character and intensity of the impact of institutional factors onto the unemployment rate in individual V4 countries should indicate space for a wider application of institutional characters by economic policymakers. They should be warned about the threat of overusing the institutional factors having a negative effect onto the development of both structural and cyclical unemployment.

Keywords:

unemployment, NAIRU, institutional factors, labor market, V4

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1. Introduction

Examining the institutional factors plays a key role in determining the character of their impact on the labour market functioning, as well as the economy's flexibility and competitiveness. For this reason, the issues are of interest both for individual EU Member States and for this bloc as a whole. In this respect, the key document for the Member States includes the **Employment Lisbon Strategy (International Affairs, September 2010)**. The fundamental task consists in providing access to the labour market and preventing segmentation and inactivity or gender inequality. The development of structural unemployment is subject to regular assessment, being associated with monitoring the fulfilment of some general and national objectives in the field of employment and unemployment.

The first objective of our analysis consists in associating the specified institutional factors of the labour market with adequate and yet accessible data, so-called indicators of the Visegrad Group countries (hereinafter only as "V4"). In addition, we intend to extend the Sekhon's standard model for inflation with institutional factors. For the purposes of estimating the NAIRU in V4 countries, we have selected the Kalman filter method with a higher than common smoothing coefficient of the NAIRU (Non-Accelerating Inflation Rate of Unemployment). We will then compare the NAIRU values obtained through the previously fine-tuned model with the NAIRU values reflecting the development of individual institutional factors, thus establishing the intensity of the negative or positive impact of the institutional factors on the NAIRU in the whole examined interval according to the models. The analysis of the character and intensity of the effect of institutional factors on the unemployment rate in individual V4 countries will be completed with the recommendations for economic policymakers.

The second part defines the terms of selected institutional factors with respect to their effect on the labour market. The third part offers a brief outline of the authors dealing with the substitution between inflation and unemployment, while also describing the substance of extending the standard model and modifying the method used to estimate the NAIRU. Part four compares the NAIRU values obtained from the original models with the models containing the institutional factors. Part five will contain the summary of the performed adaptations of the standard model or the method of the NAIRU estimate, as well as the quantification of the intensity and character of the effect of the institutional factors on the NAIRU or the unemployment rate.

2. Defining the terms of selected institutional factors with respect to their effect on the labour market

In accordance with the work of **Tvrdoň** (5/2008), this paper examines 5 fundamental institutional factors:

1) The **Employment Protection Legislation** (EPL) has a positive effect on the performance of several labour market indicators (e.g. work productivity and efficiency), reduces fluctuations in unemployment development, and supports occupational safety, job and income certainty, the youth on the labour market, and the unemployed over a long period of time. However, EPL is also perceived as an obstacle to labour market flexibility, as strict EPL application makes job dismissals more difficult, but on the other hand, employers are becoming more cautious when hiring new staff, which reduces the likelihood of finding a job for the unemployed.

2) The effect of the **wage bargaining structure** depends on the degree of centralising / decentralising wage bargaining, as the more decentralised the bargaining process is, the less power the trade unions have. In addition, it remains true that a high representation of trade unions and the legislation extending the scope of trade unions' authority is undesirable in terms of effective functioning of the labour market, that countries with centralised bargaining show better functioning of the labour market, that it is easier to achieve a reduction in the wage growth rate depending on the decline in the growth rate of the work productivity in the case that bargaining takes place on the national level, rather than on the company or sector level, and that a higher application rate of collective agreements results in a stronger effect of the negative shock of work productivity on unemployment.

3) The **Active Labour Market Policies** (ALMP) may affect employment in a number of ways; work productivity may be boosted using retraining and training programmes in the case of the direct support of creating jobs. With their help, the unemployed may be kept in the workforce even in the case of longer inactivity. Jobs supported within the ALMP result in driving out jobs that are not supported. The ALMP makes the process of searching for a new job more efficient through advisory activity of the State offered to the unemployed, increases the competitiveness of those who have completed qualification training, and shifts workforce from stagnating sectors with a low productivity to an expanding sector with a high productivity using training programmes. On the other hand, programme participants have less time to search for a job and when placing into ALMP programmes, more skilled job applicants are preferred.

4) **The tax burden of labour** is represented by a tax wedge (tax wedge = (income tax + total social security contributions) / (gross salary + employer's social security contributions)). Taxation of labour increases the space between the employer's costs and employees' income. Any changes in the tax wedge affect not only the bargaining

approach of trade unions but also individual decision-making on job offer. In the case of generous social benefits, higher taxation may result in the decline in the willingness to work. Systematically, the taxation of labour does not have a long-term effect on unemployment, even though short-term effects are considerable. The reason for reducing the taxation of unskilled labour and subsidies for job creation for this workforce group is increasing demand and reducing unemployment in this group, leading to a reduction in overall unemployment.

5) **Unemployment benefits** (UB) improve labour allocation (allowing workers to wait for a job offer with a higher salary) and prevent the decline in the consumption among the unemployed. On the contrary, the UB presence may drive out private savings; there is a direct positive correlation between the length of providing the benefits and the length of unemployment; and in addition, higher social benefits result in higher unemployment, and higher social benefits increase unemployment owing to a lower intensity of job search.

3. Summary of authors dealing with the relationship between inflation and unemployment and the NAIRU estimate methods including our adaptations of the standard inflation model

According to **Humphrey** (1985), it is **Phillips** (1958), founder of the modern version of the Phillips curve (hereinafter only as the “PC”) that acts as the milestone in the development of the substitution between the price development and the unemployment rate. Nevertheless, he was preceded by a number of authors, such as Law, Thornton, Attwood, Mill, Fischer, Tinbergen, Klein and Goldberger, or Brown and Sultan. The authors affecting further the development of this concept include, in particular, **Samuelson et al** (1960), **Phelps** (1967), **Friedman** (1968), and **Modigliani et al** (1975). This paper follows the concept entitled by its author as the Non-Accelerating Inflation Rate of Unemployment. According to **Tobin** (1997), the NAIRU is a result of the macro-economic balancing of pressures from excess demand markets and pressure from excess supply markets¹.

Richardson et al (2000) divide the methods of estimating this unobservable variable in purely statistical methods (in particular, these include for instance the methods of the Hodrick-Prescott filter – hereinafter only as the “HP filter”), structural methods (these include, for instance, the system of equations describing collective bargaining on wages and prices, i.e. the so-called bargaining model), and the reduced form approach (for instance, this include the Kalman filter)². Due to the fact that the Visegrad Group countries represent small and open economies exposed to permanent

¹ For a more detailed outline of the historical development of the substitute concepts, see for instance Jašová (2011).

² For a more detailed outline of the methods of the NAIRU estimate, see for instance Jašová (2011).

changes, owing to which they are situated in a highly unstable environment, the Kalman filter will be used for the purposes of the NAIRU estimate. This method proved effective in the previously conducted research (e.g. **Jašová et al, IV/2012**). We intend to take the experience from this research in setting a higher smoothing coefficient (0.6) than the generally used value of 0.2.

Another adaptation will concern the standard inflation model (**Sekhon, 1999**):

$$\pi_t - \pi_t^e = \beta(u_t - \bar{u}_t) + \partial X_t + \nu_t, \quad (1)$$

Where π_t is the estimate of the actual inflation rate, π_t^e is the expected inflation rate, u_t is the unemployment rate, \bar{u}_t is the NAIRU, X_t represents the regressors controlling supply shocks (oil price, importation prices, or exchange rates), and ν_t is the error element.

We have extended this model with the institutional factor effect, which is presumed to make the NAIRU estimate more precise. The model remains to be based on the PC extended with expectations and has the following form:

$$\pi_t - \pi_t^e = \beta(u_t - \bar{u}_t) + \partial X_t + \varepsilon Y_t + \nu_t, \quad (2)$$

Where π_t , resp. π_t^e , u_t , resp. \bar{u}_t , resp. X_t , or ν_t corresponds to the equation (1), Y_t is a newly incorporated variable controlling the effect of institutional factors on the labour market (e.g. minimum wage, tax wedge, collective bargaining, or active employment policy).

4. Defining and ascertaining the period with a negative and positive effect of the institutional factors on the NAIRU and the unemployment rate in the Visegrad Group countries using the NAIRU concept and Kalman filter with an alternative smoothing value

The fundamental part will consist in the detailed empirical analysis of the effect of the institutional factors on the NAIRU and the unemployment rate using the extended standard model and the econometric method of the Kalman filter adapted with a higher NAIRU smoothing value than commonly used.

4.1 Defining the analysis data base

In the case of the Czech Republic, the institutional factor of the legislative employment protection will be represented by the indicators of the definite-term employment (source: Eurostat) and gross minimum wage (source: Ministry of Labour and Social Affairs). The structure of wage bargaining will be analysed by means of the

indicator of the total number of employees among employers with trade unions and the total number of employees covered by collective agreements of higher degree (source: Czech-Moravian Confederation of Trade Unions and the Ministry of Labour and Social Affairs). The concept of the active labour market policies in the model will be represented by the indicator of expenditures on active labour market policies (source: Eurostat). For the purposes of mapping the impact of the tax burden on labour, we will apply the tax wedge indicator (source: Eurostat). The system of social benefits during the unemployment will be represented by the indicator of the average amount of monthly unemployment benefits (source: Ministry of Labour and Social Affairs).

In the case of Slovakia, Hungary and Poland, the legislative protection of employment in the model will be represented by the indicators of the definite-term employment (source: Eurostat) and gross minimum wage (source: Eurostat). The structure of wage bargaining on gross wages will be represented by the indicator of collective agreement coverage in % (source: European Company Database – ECDB, provided by the European Trade Union Institute – ETUI). The concept of active labour market policies will be included in the model by the indicator of expenditures on active labour market policies (source: Eurostat). For the purposes of mapping the impact of the tax burden on labour, the tax wedge indicator will be applied (source: Eurostat). The system of social benefits during the unemployment will be mapped by means of the indicator of the average amount of monthly unemployment benefits per person in euros (source: Eurostat).

In the **national economy of the Czech Republic**, the development of prices is described by the deflator of household consumption according to national accounts of the Czech Republic. The labour market is represented by the recorded unemployment rate. The significant explanatory variables include the annual changes in the exchange rate to EURO, importation prices, and the representatives of the above-mentioned institutional factors, i.e. expenditures on active employment policies, the tax wedge, the average amount of monthly unemployment benefits, the total number of employees among employers with trade unions, the total number of employees covered by collective agreements of higher degree, minimum wages, and definite-term employment contracts. In **Slovakia, Hungary and Poland**, the prices were represented by the deflators of household consumption according to the OECD (Organisation for Economic Co-operation and Development). The labour market development is described by the unemployment rate as defined by the ILO (International Labour Organization) in % (source: OECD). In addition to the above-mentioned indicators of institutional factors, the explanatory variables also include the annual changes in the exchange rate, importation prices (except for Poland), indirect taxes, and Brent oil prices.

The time series of the price development **in all the Visegrad Group countries** correspond to the adaptive forming of expectations, i.e. the annual change at time “t-1”

is subtracted from the annual change at time “t”. Before incorporating into the models, the unemployment rate in all the countries was seasonally adjusted by means of the multiplicative running average. The stationarity of the applied time series was tested using the Augmented Dickey – Fuller test.

4.2 Specification of the econometric apparatus and the definition of the period with a negative or positive effect of the institutional factors on the NAIRU and the unemployment rate as a whole

The estimate of the NAIRU development in the V4 Member States will apply the econometric method of the **Kalman filter with an alternative smoothing coefficient of 0.6**.

In the following chapter (3), we will compare the NAIRU values as estimated by the models without the effect of the institutional factors as published in the paper written by **Jašová et al** (2013), with the NAIRU values reflecting the effect of individual institutional factors. This will result in determining the intensity of the negative and positive effect of the institutional factors on the NAIRU in the whole examined period.

The negative impact on the NAIRU is established in the event that the NAIRU value taken from the model extended with the institutional factors is higher than the NAIRU value from the original model without such factors, as specified in the paper written by **Jašová et al** (2013). **The positive impact on the NAIRU** occurs in the event at the NAIRU value taken from the model extended with the institutional factors is lower than the NAIRU value from the original model without such factors. The quantification of the effect of institutional factors on the NAIRU is derived from the percentage value always as the average value for the entire examined period. The resulting quantification of the effect of institutional factors on the NAIRU was based only on the model estimates according to the Kalman filter with smoothing value, and therefore, its conclusions will only be considered as partial, being associated with a lower informative capacity.

This model estimate is then verified by means of the development of the unemployment rate and the institutional factors. The result will serve for a brief comparison of the assessment of the nature and intensity of the effect of the institutional factor on the NAIRU within the model approach with the effect of the factors on structural unemployment specified in the following verified approach (our analysis treats both terms as identical). In addition, the verification will allow us to quantify the actual negative or positive effect of the institutional factors on the unemployment rate in particular periods (see Appendix: Tab. 1).

4.3 Detailed empirical analysis of the effect of the institutional factors on the NAIRU and unemployment rate according to the Kalman filter’s estimate with the smoothing value of 0.6

Table 1

Values of NAIRU before inserting institutional factors and their insertion into the Kalman filter with smoothing 0.6

| Name of institutional factor | Interval for movement in the NAIRU% | | | |
|---|-------------------------------------|--------------|--------------|---------------|
| | Czech Republic | Slovakia | Hungary | Poland |
| Without the influence of institutional factors | - 3,3 + 13,5 | - 4,2 + 24,8 | - 6,5 + 11,8 | - 18,8 + 32,1 |
| Definite-term employments | -2,0 + 11,6 | - 3,6 + 25,3 | - 6,9 + 13,0 | - 6,4 + 23,6 |
| Minimum wage | - 3,6 + 12,7 | - 4,9 + 22,5 | - 6,2 + 15,7 | - 4,3 + 28,7 |
| Collective agreements at the enterprise level | - 3,6 + 14,9 | X | X | |
| Collective agreements at a higher level | - 5,2 + 12,4 | X | X | X |
| Collective agreements total | X | - 5,8 + 25,7 | - 4,8 + 16,6 | - 9,0 + 30,4 |
| Expenditure on the active employment | - 3,1 + 13,9 | - 3,9 + 26,9 | - 5,0 + 13,1 | - 3,7 + 22,6 |
| Tax wedge | - 2,9 + 13,6 | - 5,6 + 30,0 | - 6,3 + 12,3 | - 7,7 + 32,9 |
| Average amount of monthly unemployment benefits | - 5,2 + 12,0 | - 3,6 + 26,9 | - 5,6 + 11,5 | - 5,1 + 26,0 |

Source: Own calculation on the basis of data from the Ministry of Labour and Social Affairs, Czech National Bank, Czech Statistical Office, Eurostat, OECD and ECDB.

In the Czech Republic, after incorporating **definite-term employments** in the model, the median of the interval for the NAIRU movement declined by 0.3 p.p. (see Table 1), which implied the existence of a very weak positive effect on the NAIRU. The analysis of the actual data confirmed a strong **negative effect** of this institutional factor on the unemployment rate in the period between Q1 2002 and Q4 2004 and Q2 – Q4 2010, as well as a very weak effect at the beginning of 1999 and in the second half of 2009. Definite-term employment had a very weak **positive** effect on the unemployment rate only in the period from Q3 2000 to Q3 2001 and in Q1 2007.

In Slovakia, according to the model, the indicator of **definite-term employments** increase the original NAIRU value by 0.6 p.p. (a very weak negative effect on the NAIRU). Comparing the model estimates with actual data confirmed their weak **negative effect** on the unemployment rate in Q1 to Q4 2001, Q1 to Q3 2004 and Q1 to Q4 2010 as well as a very weak effect in Q3 and Q4 2000. This factor played a very weak **stimulating role** for the labour market in the period of Q2 and Q3 2003 and Q3 and Q4 2008.

In Hungary, after incorporating **definite-term employments** in the model, the interval for the NAIRU movement rose by 0.4 p.p., thus implying a very weak negative impact on the NAIRU. According to the actual data, there was a very weak **negative effect** on the unemployment rate in the period from Q3 2004 to Q1 2005 and from Q1 to Q3 2010, as well as a weak effect in the periods from Q3 2006 to Q2 2007. This factor served as a source of a very weak **annual decline** in the unemployment rate.

In Poland, after incorporating **definite-term employments** in the model, the NAIRU rose by 1.9 p.p. (i.e. a very weak negative effect on the NARU). This factor showed a very weak **negative effect** on the actual unemployment rate in 2001 and a weak effect in the period of Q1 to Q4 2002 and Q1 to Q4 2010. This factor appeared to be a weak **stimulant** of the annually lower unemployment rate in the period from Q1 2004 to Q2 2005.

In the Czech Republic, after extending the original model with the effect of **the gross minimum wage**, the NAIRU dropped by 0.5 p.p. (a very weak positive effect on the NAIRU). The actual data implied a strong **negative effect** of the gross minimum wage on the unemployment rate from Q1 1999 to Q3 2000 and a very weak effect in Q1 2002. There was a weak **positive effect** of the gross minimum wage on the unemployment rate in the period of Q3 and Q4 2000. The unemployment rate dropped by 0.2 p.p. and 0.9 p.p.

After incorporation the indicator of **the gross minimum wage** in the model for **Slovakia**, the original interval median dropped by 1.5 p.p. (a very weak positive effect on the NAIRU). In the case of the minimum wage, the **annual growth of the unemployment rate** was very weakly enhanced in the period of Q4 2010 and in 2009 or the first half of 2010. Owing to this indicator, there was a strong **reduction in the unemployment rate**.

In Hungary, the indicator of **the gross minimum wage** increased the original interval median for the NAIRU movement by 2.1 p.p. (a weak negative effect on the NAIRU). **Increasing the unemployment rate** coincided with a very weak annual increase in the minimum wage in Q2 2007 and in 2010 and a weak effect in the period Q4 2006, Q1 2010, and in 2011. This factor played the **role of a very weak activator** of the labour market in Q4 2003 and Q2 2006. Unemployment rate dropped annually by 0.4 p.p. and 0.1 p.p.

In Poland, the indicator of **the gross minimum wage** increased the original interval median by 5.5 p.p. (a strong negative effect on the NAIRU). Using the development of the actual data, a very weak **negative effect** on the unemployment rate was confirmed in a long period from Q1 2008 to the end of the examined period (this impact showed except 2009). This factor serves as a weak **accelerating** means of the annual drop in the unemployment rate in the period of Q1 2005 to Q4 2007.

Including the **total number of employees among employers with trade unions in the Czech Republic** increased the NAIRU's interval median by 0.6 p.p. (a very weak negative effect on the NAIRU). A weak **negative effect** on the unemployment rate development was observed in Q1 2010, while there was a very weak effect in the period from Q2 to Q4 2010.

Including the **total number of employees covered with higher-level collective agreements** reduced the interval median by 1.5 p.p. (a very weak positive effect on the NAIRU). There was a strong **negative effect** on the annual growth of the unemployment rate in the period of Q1 to Q4 2010, as well as a weak effect in the whole year 2005. Higher collective agreements had a weak **positive effect** on the unemployment rate in the period of Q1 to Q4 2008. In this case, higher collective agreements saw an annual growth with the drop of the unemployment rate by 0.9 p.p. and 1.1 p.p.

After including the **structure of gross wage bargaining in Slovakia**, the median of the original interval dropped by 0.3 p.p. (a very weak positive effect on the NAIRU). This institutional factor was found to have a very **negative effect** on the unemployment rate in the period of Q1 to Q3 2004. This factor played the role of a very weak **stimulator for the labour market** in 2003. Compared to the previous year the unemployment rate dropped annually by 1.1 p.p.

The structure of gross wage bargaining in Hungary increased the median of the original interval by 3.2 p.p. (a weak negative effect on the NAIRU). Strong **negative pressures** on the unemployment rate were found in the period of Q2 to Q4 2010, being very weak in Q2 to Q4 2008. According to our analysis, this factor **did not function as a stimulator** of the annual decline the unemployment rate in any examined period.

In **Poland, the structure of gross wage bargaining** according to the model increased the interval median for the NAIRU movement by 4.0 p.p. (a weak negative effect on the NAIRU). According to the actual economic data, there were very weak **negative pressures** on the unemployment rate in the years 2002 and 2009 and in the period of Q1 to Q4 2010. A weak effect of this institutional factor as the **stabiliser** was localised in the period of Q2 to Q4 2008.

Including the **expenditure on the active employment policy in the Czech Republic** in the model increased the interval median for the NAIRU movement by 0.3 p.p. (a very weak negative effect on the NAIRU). The actual data confirmed a very weak **negative effect** of this factor on the unemployment rate in. According to the data of the actual unemployment rate, no **positive effect** of this factor was found.

Including the **expenditure on the active employment policy in Slovakia** increased the interval median for the NAIRU movement by 1.2 p.p. (a very weak negative effect

on the NAIRU). A very weak **negative effect** of this factor was supported with the real economy development only in Q1 to Q3 2004 and in Q1 to Q3 2009. This factor became an **impulse for a very weak decrease in the unemployment rate** during 2008.

The data of the **expenditure on the active employment policy in Hungary** increased the interval median for the NAIRU movement by 1.4 p.p. (a very weak negative effect on the NAIRU). There was a very weak **negative effect** on the unemployment rate development in the period of Q4 2009 to Q4 2010 and in the period of Q1 and Q2 2009. This factor became a very weak **impulse for the annual decline** in the unemployment rate in the period of Q1 and Q2 2004.

The expenditure on the active employment policy in Poland increased the interval median for the NAIRU movement by 2.8 p.p. (a weak negative effect on the NAIRU). In reality, there was a very weak **negative effect** on the unemployment rate in 2001 and 2009. The actual data development did not confirm the effect of this factor as a **stimulator** of the annual unemployment rate decline.

The taxation of labour in the **Czech Republic** (the indicator of the **tax wedge**) increased the interval median for the NAIRU movement by 0.3 p.p. (a very weak negative effect on the NAIRU). The actual data confirmed its weak **negative effect** on the unemployment rate in 2010 and a very weak effect in Q4 2004. This very weak **positive effect** on the unemployment rate was discovered in the period of Q1 to Q3 2007. In these periods, the value of the tax wedge grew annually by 0.5 p.p. and the unemployment rate dropped by 1.5 p.p.

After taking into account the effect of the **tax wedge in Slovakia**, the original interval median rose by 1.9 p.p. (a very weak negative effect on the NAIRU). The data confirmed very weak **negative pressures** of this institutional factor on the unemployment rate in 2010, as well as in Q1 and Q2 2001. This factor acted as a weak **stimulator of the labour market** in the period of Q1 to Q2 2011.

The tax wedge in Hungary increased the original interval median by 0.3 p.p. (a very weak negative effect on the NAIRU). There was a very weak **negative effect** on the unemployment rate in the period of Q1 2011 and a weak effect in the period of Q4 2008 and in Q2 2011. This factor became a very weak **source of enhancing the labour market flexibility** in the period of Q2 2006 and during 2007.

After including the **tax wedge in Poland** in the model, the original interval median rose by 5,9 p.p. (a strong negative effect on the NAIRU). In accordance with the development of the tax wedge and the unemployment rate, very weak **negative effects** were found in 2010. This factor served as a weak **accelerator** of the unemployment rate decline in the period of Q1 2003 to Q4 2004. In the period there was an annual drop in the unemployment rate of 0.4 p.p.

Taking into account the **average amount of monthly unemployment benefits in the Czech Republic**, the original interval median for the NAIRU movement dropped by 1.7 p.p. (a very weak positive effect on the NAIRU). There was a strong **negative effect** on the unemployment rate in the period of Q1 2002 to Q4 2004 and a very weak effect in the period of Q1 to Q4 2009. The average amount of monthly unemployment benefits had a **strong positive effect** on the unemployment rate in the period of Q4 2006 to Q4 2008.

In Slovakia, the system of social benefits during unemployment increased the original interval median by 1.4 p.p. (a very weak negative effect on the NAIRU). There was a very weak **negative effect** of this factor on the unemployment rate in the period of Q1 to Q3 2004 and Q2 to Q4 2009. This factor became a weak **stimulator of the labour market** in the period of Q3 2006 to Q2 2007. There was an annual growth in the value of average unemployment benefits, while the unemployment rate dropped annually by 1.0 and 3.0 p.p.

In the case of **the system of unemployment benefits in Hungary**, there was an increase of the original interval median only of 0.3 p.p. (a very weak negative effect on the NAIRU). Owing to an annual growth of this factor, there was a very weak **increase in the unemployment rate** in the period of Q4 2005 to Q2 2007 and a strong effect in Q1 2008 to Q4 2009. This factor functioned as a very weak **accelerator** in the period of Q3 to Q4 2007.

After including the **system of unemployment benefits in Poland** in the model, the original interval median rose by 3.8 p.p. (a weak negative effect on the NAIRU). In accordance with the data, there was a very **negative effect** of this factor in 2010. The factor functioned as a very weak **accelerator** of the annual decline in the unemployment rate in the period of Q2 2011. In the period, there was a growth in the value of the average unemployment benefits, while the unemployment rate dropped.

5. Summary of the adaptations of the standard model or the NAIRU estimate method, analysis conclusions, and recommendations for economic policymakers

1) Initial comparison implies that in the case of the **indicator of the definite-term employment** it was only in the Czech Republic where there was established a very weak positive effect on the NAIRU. On the contrary, in other V4 countries, a very weak negative effect was localised. **Altogether, we have thus estimated the effect of the indicator of the definite-term employment on the NAIRU as very weakly negative.**

In the case of the *minimum wage indicator*, the comparison of the conclusions on the nature of its effect on the NAIRU is no longer so unambiguous, both in the perspective of individual countries and the perspective of the results of both alternative smoothing coefficients of the Kalman filter. In the Czech Republic, the models with both smoothing coefficients agreed on the assessment of the effect of this indicator on the NAIRU as very slightly positive. In Slovakia, it was deemed as very slightly positive only by the Kalman filter with the smoothing of 0.6. On the contrary, in Hungary, both filters assessed the effect of this indicator on the NAIRU as negative, while the model with the smoothing of 0.6 as slightly negative. **All in all, our analysis shows that in the V4 countries, the minimum wage indicator had a very weak to weak effect on the NAIRU.**

In the Czech Republic, the effect of the *indicator of collective bargaining on the company level* on the NAIRU is perceived by the models as unambiguously very slightly positive. The assessment of the effect of *higher-level collective bargaining* may be found in the interval from slightly positive (smoothing of 0.6). The latter interpretation also applies to Slovakia. In Hungary, the models associated the indicator of collective bargaining with a slightly negative effect on the NAIRU. In Poland, the effect's intensity was slightly negative. **In general, the indicator of collective bargaining in the V4 countries had a very slightly negative to slightly negative effect on the NAIRU.**

According to the models with both smoothing coefficients, the effect of the *indicator of the expenditure on the active employment policy* on the NAIRU was jointly perceived as very slightly negative in the Czech Republic, Slovakia and Hungary. In Poland, the model with the smoothing of 0.6 assessed it as slightly negative. **In general, our analysis shows that the effect of the expenditure on the active employment policy on the NAIRU may be considered very slightly negative.**

The effect of the *tax wedge indicator* on the NAIRU offered an ambiguous assessment, as the models with the lower smoothing coefficient saw it as very slightly negative (Czech Republic, Slovakia, and Hungary) to strongly negative (Poland), while those with the higher smoothing coefficient imply a wide range of assessment from neutral (Czech Republic), through very slightly positive (Slovakia and Hungary), to slightly negative (Poland). **All in all, the effect of the tax wedge on the NAIRU in the V4 countries may be assessed as neutral.**

In the case of the *indicator of the average amount of monthly unemployment benefits*, the models agreed in the Czech Republic and Hungary that it has a very weak positive or very weak negative effect. In Slovakia and Poland, the model with the smoothing coefficient of 0.6 estimated a very weak negative or weak negative effect. **The overall effect of the average amount of the monthly unemployment benefits on the NAIRU in the V4 countries may thus be described as a neutral.**

Having taken into account all the above-mentioned conclusions, the overall effect of the institutional factors on the NAIRU in the V4 Member States may be quantified as very slightly negative.

2) The model estimate of the effect of the institutional factors on the labour market was verified by means of the development of the unemployment rate and the institutional factors. At first, the verification did not confirm the model conclusions on a very slight positive effect of the institutional factors on the NAIRU in some periods (in the Czech Republic and Slovakia). An agreement was found in the case of the indicators of the definite-term employment or the expenditure on the active employment policy (a very slightly negative effect) and collective bargaining (a very slightly negative to slightly negative effect). In addition, the analysis found differences in the assessment of the intensity of the negative effect of individual factors. According to the model, the minimum wage admitted, apart from a very slightly negative effect, a slightly negative effect, as well. The neutral intensity of the tax wedge's effect according to the model was, following the data verification, reclassified into very slightly negative to zero. The indicator of the average amount of monthly unemployment benefits was assessed as neutral in the model, whereas the verification changed this conclusion to a very slightly negative effect.

Considering the final effect of the institutional factors on the NAIRU according to the Kalman filter and following the verification using the actual data (in this step, the indicator is called structural unemployment) did not eventually imply any difference, as it was of a very weak negative intensity according to both approaches.

3) The verification produced a localisation of individual periods in which the institutional factors had a negative or positive effect on the unemployment rate. This more sophisticated analysis implies that in the case of the *indicator of the definite-term employment*, both smoothing coefficients estimated the intensity of the effect of this institutional factor on the unemployment rate in the V4 countries as slightly negative. Poland was the only country where there was estimated a slightly positive effect according to the coefficient of 0.6. **Altogether, we estimated the effect of the indicator of the definite-term employment on the unemployment rate as slightly negative.**

In the case of the *indicator of the minimum wage*, it had a very slightly negative effect in the V4 countries according to the smoothing coefficient of 0.6. On the contrary, in Slovakia, a lower intensity as detected (very weak for the coefficient of 0.6) and in Poland, the negative effect was not at all localised following the verification of the model estimate. There was a stronger positive effect than the average V4 estimate in Slovakia with the smoothing coefficient of 0.6. On the other hand, a weaker positive effect (very slightly positive) was detected in Hungary. **The overall**

assessment of the effect of the indicator of the minimum wage on the unemployment rate in the V4 countries seems very slightly negative.

In the V4 countries, the *indicator of collective bargaining* had a slight negative effect on the unemployment rate with the smoothing coefficient of 0.6. The exception consisted in the development in the Czech Republic using both coefficients. With the smoothing coefficient of 0.6 for higher-level collective agreements, a strong negative effect was localised. A positive effect was estimated to be of a very weak intensity. In addition, the category of exceptions also includes Poland with the coefficient of 0.6, indicating a weak intensity. In the Czech Republic, a slightly positive effect was found for higher-level collective agreements. **The overall effect of the indicator of collective bargaining on the unemployment rate in the V4 countries may be assessed as slightly to very slightly negative.**

In the V4 countries, the *indicator of the expenditure on the active employment policy* had a very slight negative effect on the unemployment rate for both coefficients. In the Czech Republic the verification showed no effect of this indicator on unemployment. In addition, the actual data did not confirm the positive effect of this factor on unemployment in the Czech Republic and Poland. **The overall assessment of the effect of the indicator of the expenditure on the active employment policy on the labour market in the V4 countries clearly suggests a very weak negative intensity.**

In the case of the *indicator of the tax wedge*, the smoothing coefficient of 0.6 offered a very slightly negative effect on the unemployment rate in the V4 countries. The positive effect is characterised through a combination of a weak (in Slovakia and Poland) and very weak intensity (in the Czech Republic and Hungary). **Having considered the very weak negative effect with the coefficient of 0.6 the overall assessment of the effect of the tax wedge indicator on the unemployment rate in the V4 countries may be regarded as a very weak negative effect too.**

In the V4 countries, the *indicator of the average amount of monthly unemployment benefits* had a neutral effect on the unemployment rate using both smoothing coefficients. In the Czech Republic and Hungary, there was a strong negative effect, while in Slovakia and Poland, no negative effect was at all established. The positive effects on overall unemployment were of a very weak intensity. The exception consisted in the Czech Republic, where there was a strong positive effect, and Slovakia, where it was weak. In general, the positive effect may be assessed as weak, since its very weak intensity in Hungary and Poland was compensated with a strong intensity found in the Czech Republic and Slovakia. **The overall assessment of the effect of the indicator of the average amount of monthly unemployment benefits in the V4 countries may be deemed as neutral.**

Having considered the whole interval of the intensity of the effect ranging from slightly negative (definite-term employment contracts), through slightly to very slightly negative (collective bargaining), as well as a very slightly negative effect (minimum wage and expenditure on the active employment policy), up to a neutral effect (the tax wedge and the average amount of monthly unemployment benefits), the overall effect of the institutional factors on the unemployment rate in the V4 countries may be quantified as very slightly negative.

4) The analysis of the effect of the institutional factors on the unemployment rate, which was obtained after the verification of the model estimate using the actual data, shows that economic policymakers are provided with space to apply their instruments in two directions. First, they should apply more those institutional factors where a positive impulse on reducing the unemployment rate was demonstrated. On the other hand, they should avoid excessive use of the institutional factors with a negative effect on unemployment.

The analysis of the character and intensity of the effect of the institutional factors on the unemployment rate in individual V4 countries showed, on the one hand, space for greater application of the institutional factors by the economic policymakers. What helped to reduce unemployment was the indicator of the minimum wage (Poland and Slovakia), expenditure on the active employment policy (Slovakia), tax wedge (Slovakia and Poland), and the average amount of monthly unemployment benefits (Slovakia). On the other hand, it is necessary to avoid excessive use of some institutional factors. The following ones have a negative effect on the development of unemployment: definite-term employment (Slovakia, Hungary, and the Czech Republic), minimum wage (the Czech Republic and Hungary), collective bargaining (Slovakia, the Czech Republic and Hungary), expenditure on the active employment policy (Hungary, Poland and the Czech Republic), tax wedge (the Czech Republic and Hungary), and the average amount of monthly unemployment benefits (the Czech Republic, Poland and Hungary).

Appendixes

Tab. 1

Final evaluation of the intensity of the influence of institutional factors on unemployment to 4.3 and section 5 (Kalman filter with smoothing 0.6)

| Indicator institutional factor and the V4 countries | Negative impact on the unemployment rate | | Positive impact on the unemployment rate | | The overall impact on the unemployment rate (- cant negative impact of total and + cant positive influence) | | The overall impact assessment in accordance with the institutional factor for V4 |
|--|--|---|--|--------------------------------------|---|--|--|
| | The incidence (number of quarters for the entire reporting period) | The intensity of the negative impact of total | The incidence (number of quarters for the entire reporting period) | The intensity of the positive impact | The incidence (number of quarters for the entire reporting period) | The intensity of the positive / negative influence | The intensity and nature of the influence |
| Definite-term employments | | | | | | | Weak negative |
| Czech Republic | 19 | Strong | 6 | Very weak | -13 | Weak negative | |
| Slovakia | 13 | Weak | 5 | Very weak | -8 | Weak negative | |
| Hungary | 16 | Strong | 6 | Very weak | -10 | Weak negative | |
| Poland | 12 | Weak | 8 | Weak | -4 | Very weak negative | |
| Minimum wage | | | | | | | Very weak negative |
| Czech Republic | 19 | Strong | 14 | Weak | -5 | Very weak negative | |
| Slovakia | 7 | Very weak | 22 | Strong | 15 | Strong positive | |
| Hungary | 17 | Strong | 2 | Very weak | -15 | Strong negative | |
| Poland | 4 | Very weak | 10 | Weak | 6 | Very weak positive | |
| Collective agreements | | | | | | | Weak negative |
| Czech Republic | | | | | | | |
| At the enterprise level | 16 | Strong | 2 | Very weak | -14 | Weak negative | |
| At a higher level | 28 | Very strong | 11 | Weak | -17 | Strong negative | |
| Slovakia | 7 | Very weak | 4 | Very weak | -3 | Very weak negative | |
| Hungary | 22 | Strong | 0 | Unproven | -22 | Strong negative | |
| Poland | 11 | Weak | 9 | Weak | -2 | Very weak negative | |
| Expenditure on the active employment policy | | | | | | | Very weak negative |
| Czech Republic | 4 | Very weak | 0 | Unproven | -4 | Very weak negative | |
| Slovakia | 6 | Very weak | 6 | Very weak | 0 | Neutral | |
| Hungary | 8 | Weak | 2 | Very weak | -6 | Very weak negative | |
| Poland | 4 | Very weak | 0 | Unproven | -4 | Very weak negative | |
| Tax wedge | | | | | | | Very weak negative |
| Czech Republic | 15 | Strong | 6 | Very weak | -9 | Weak negative | |
| Slovakia | 8 | Weak | 9 | Weak | 1 | Very weak positive | |
| Hungary | 13 | Weak | 4 | Very weak | -9 | Weak negative | |
| Poland | 3 | Very weak | 8 | Weak | 5 | Very weak positive | |
| Average amount of monthly unemployment benefits | | | | | | | Neutral |
| Czech Republic | 22 | Strong | 15 | Strong | -7 | Very weak negative | |
| Slovakia | 6 | Very weak | 11 | Weak | 5 | Very weak positive | |
| Hungary | 22 | Strong | 6 | Very weak | -16 | Strong negative | |
| Poland | 4 | Very weak | 4 | Very weak | 0 | Neutral | |

Source: Own calculation on the basis of data from the Ministry of Labour and Social Affairs, Czech National Bank, Czech Statistical Office, Eurostat and ECDB and ETU.

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