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Estimating the Regional Natural Rate of Unemployment: The Evidence from the Czech Republic

Abstract

The paper deals with development of the regional unemployment rate in the Czech Republic. The unemployment rate differed significantly among the Czech NUTS 3 regions during the period 2005 and 2012. According to previous studies high unemployment is caused by drop in economic performance or by some structural problems in the region. We can see that the development of the Czech national unemployment rate was correlated with the economic cycle. In other words, it means that during economic growth the unemployment rate is decreasing and during economic downturn it is increasing. We used Czech Ministry of Labour and Social Affairs monthly seasonally adjusted data during the observed period between the years 2005 and 2012. We have applied 2005 registered unemployment methodology. In total, we had 96 observations. We also applied the Hodrick-Prescott filter for estimating the natural rate of unemployment. This method is often used for estimating the potential output and is possible to use in the case of unemployment. Our empirical results show that in most regions the real unemployment rate was lower than the natural rate of unemployment during the pre-crisis period. In other words, it means that the Czech labour market was in positive unemployment gap. However, this gap was not the same in all regions. We found that the positive unemployment gap was lower in the problematic regions like the Ustecky and Moravskoslezsky region. These findings suggest that these regions still have to face some structural problems and the labour market is not so flexible as in the rest of regions. In addition, we also found that the natural rate of unemployment has shifted permanently higher in comparison with the pre-crisis period.

Key Words

Czech Republic, Hodrick-Prescott filter, natural rate of unemployment, regional disparities

JEL Classification: C51, E01, E24

Introduction

One of the key macroeconomic indicators is the unemployment rate which shows labour market performance. The traditional understanding means that if this indicator is increasing, labour market performance is worsening and vice versa. In addition, labour market development is closely associated with the economic cycle and we can say that economic performance influences the situation on the labour market. A deterioration of labour market performance could be also associated with a widespread expansion of the informal economy [3]. Moreover, sufficient labour market performance is subject to a

corresponding economic performance. The past economic crisis has hit the European Union Member States´ labour markets especially hard. Unemployment has been a recurrent problem in most European Union Member States including the Czech Republic for the last decades and it has become a major concern among not only policymakers but also the society as a whole.

The aim of this paper is to compare labour market development in the Czech NUTS 3 regions in the period between the years 2005 and 2012. We also compare development of the registered unemployment rate in comparison with the natural rate of unemployment. For this purpose, we applied the Hodrick-Prescott filter as the method how to estimate the natural rate of unemployment. The paper is structured as follows: the introductory section deals with methodological-theoretical aspects of the natural rate of unemployment and its relationship with the real unemployment rate and economic performance. In the second part, we described the method (the Hodrick-Prescott filter) used in the paper and in the third, empirical, section, we compared labour market development among the Czech NUTS 3 regions and the last part concludes.

1. Theoretical background

The concept of the natural rate of unemployment (NRU) represents the hypothetical unemployment rate consistent with aggregate production being at the "long-run" level. This level is consistent with aggregate production in the absence of various temporary frictions such as incomplete price adjustment in labour and goods markets. The natural rate of unemployment therefore corresponds to the unemployment rate prevailing under a classical view of determination of activity. It is mainly determined by the economy's supply side, and hence production possibilities and economic institutions. If these institutional features involve permanent mismatches in the labour market or real wage rigidities, the natural rate of unemployment may feature involuntary unemployment.

Romer [14] argues that the development of the theory of the natural rate of unemployment came in the 1960s where economists observed that the Phillips-curve relationship between inflation and unemployment began to break down. Until then, it was widely believed that a stable negative relation between inflation and unemployment existed. This belief had the policy implication that unemployment could be permanently reduced by expansive demand policy and thus higher inflation. Nevertheless, if we look at the original Friedman´s paper [1] we do not find a clear, well-defined characterization of this concept, but rather description of some features that it should have. This resulted in the hysteresis hypothesis, which states that cyclical fluctuations in the labour market might affect the unemployment rate permanently and might lead to a long-term persistence. This means that the unemployment should be an integrated process (see [3]).

According to Weiner [18] when the economy is at the natural rate of unemployment, inflation tends to be constant from one year to the next. Individuals come to expect this inflation rate and base their decisions on it. Any attempt to use monetary of fiscal policy to reduce unemployment below the natural rate of unemployment ultimately results in higher inflation. Under such a scenario, aggregate demand increases, prices rise, but wages initially

lag behind. As a result, firms have an incentive to hire more workers to produce more output and the unemployment rate declines. The decline in unemployment is temporary, however, because workers eventually demand higher wages. The increase in inflation, in contrast, is permanent. The central bank can set the inflation or the economic cycle. If the central bank follows the inflation variability, the society must tolerate the output gap variability. On the other side central bank can set the economic cycle goal. It means the central bank minimises the output gap variability (for more detailed analysis see Kotlán [10]).

The OECD distinguishes between a long-run structural rate of unemployment (NRU), corresponding to Friedman's original natural rate, determined by economic fundamentals, and the non-accelerating inflation rate of unemployment (NAIRU) as a short-run phenomenon. The latter may differ from the NRU, when structural or demand shocks occur. In general, the NAIRU is considered an extension of Friedman's natural rate when labour markets are not competitive and most of the literature overlaps the two concepts (see [8]).

2. Methodology

Based on Němec [12], Tasci [16], Tvrdon, Tuleja and Verner [17] and da Silvia Filho [15] we applied the Hodrick-Prescott filter (HP filter) for estimation natural rate of unemployment (NRU). This method is quite frequently used to filter the trend and the cyclical time series. To estimate the natural rate of unemployment, it is necessary to have just the time series of the unemployment rate – in our case the registered one. The only input parameter for the optimal filter, we have to specify, is an appropriate smoothing constant λ. It is defined as the ratio of dispersion of shock causing cyclical fluctuations and shocks affecting the growth trend [7].

The filter is characterized by this formula [6]:

$$Min\left\{\sum_{t=1}^{T}\left(\ln U_t - \ln U_t^*\right)^2 + \lambda\sum_{t=2}^{T-1}\left[\left(\ln U_{t+1}^* - \ln U_t^*\right) - \left(\ln U_t^* - \ln U_{t-1}^*\right)\right]\right\} \quad (1)$$

where U denotes the registered unemployment rate, U^* is the natural rate of unemployment, λ is a parameter determining the smoothness of the trend smoothing. For $\lambda = 0$ the natural rate of unemployment is equal to the real unemployment rate, for $\lambda \to \infty$ the trend will be a straight line.

When choosing a value of smoothing constant λ, we then drew on generally accepted recommendations – experts consider optimal value 14400 for monthly data, 1600 for quarterly data and 100 for annual data (Rozmahel [13], Gerlach and Yiu [2], Zimkova and Barochovský [19] or Hájek and Bezděk [6].

Monthly national and regional (NUTS 3 level) unemployment rate between the years 2005 and 2012 obtained from Ministry of Labour and Social Affairs database were applied. The standard ANOVA (analysis of variance) was carried out in order to determine the presence of monthly seasonality in the unemployment rates series. Unemployment rates usually

exhibit significant seasonality. There are several methods and techniques to adjust time series, e.g. Census X12 and TRAMO/SEATS. The first program is produced and widely used by the U.S. Census Bureau.

TRAMO (Time series regression with ARIMA noise missing observations and outliers) and SEATS (Signal extraction in ARIMA time series), was developed by Gómez and Marawall [4]. For more details to seasonal adjustment and TRAMO/SEATS method see Gómez and Marawall [5]. TRAMO preadjust the series to be adjusted by SEATS [11]. Both of them are officially used by Eurostat and Czech statistical office. Hence this method was applied to seasonal adjustment.

3. Empirical results

Table 1 shows development of real gross domestic product between the years 2005 and 2009. Based on Eurostat data we computed the growth rate of real gross domestic product. As seen from the table the growt rate was significantly affected by the economic crisis. Most regions recorded high growth rate of real GDP except Jihočeský, Plzeňský and Liberecký region in 2007. For more detailed analysis of development the real economy see [17].

Tab. 1 Real gross domestic product growth in NUTS 3 regions (based on constant prices – year 2005)

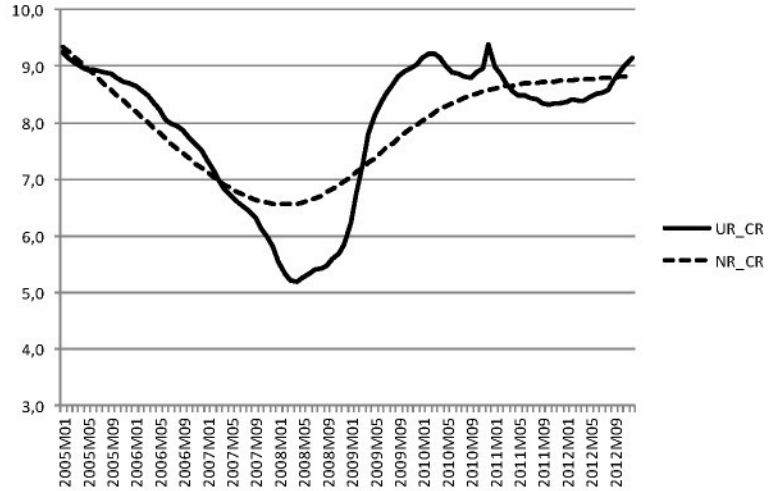
Region	2005	2006	2007	2008	2009
Hlavní Město Praha	8.1	7.6	4.4	9.3	-5.1
Středočeský	4.6	11.5	2.7	7.5	-6.6
Jihočeský	7.7	6.6	-2.3	2.7	-2.2
Plzeňský	4.3	7.7	-0.4	-1.0	-3.0
Karlovarský	3.9	2.1	1.1	3.0	-2.2
Ústecký	6.1	6.3	0.1	6.2	-0.4
Liberecký	10.9	4.9	-3.0	3.5	-5.5
Královehradecký	4.5	4.2	2.1	6.2	-3.0
Pardubický	4.5	9.0	2.2	3.7	-5.6
Vysočina	6.9	6.9	2.1	1.5	-2.8
Jihomoravský	6.0	7.6	2.7	9.4	-4.3
Olomoucký	3.0	4.7	1.9	6.9	-4.4
Zlínský	7.5	7.6	1.5	10.6	-4.2
Moravskoslezský	10.4	4.3	2.2	7.7	-8.6

Source: OECD

Figure 1 shows development of the real unemployment rate and the estimated natural rate of unemployment at the national level. As seen from figure, the real unemployment rate was below the natural rate of unemployment in the pre-crisis period (from January 2007 till May 2009). We can also say that the labour market reacted on lower economic performance with some delay. However, the unemployment rate increased sharply at the beginning of the crisis. The period from June 2009 till December 2010 can be characterized as the economic crisis with relatively high national unemployment rate which was higher compared to the estimated natural rate of unemployment. There had been seen some signs of slight recovery during this period, however the unemployment rate increased again. A full recovery started during the year 2011 when the real unemployment rate was lower than the natural one.

Nevertheless, the both the real unemployment rate and the natural rate of unemployment were higher in the comparison with the pre-crisis period. Moreover, we can say that the level of both rates were still growing.

Fig. 1 Czech natural and real unemployment rate national monthly data, 2005 – 2012



Source: Czech Ministry of Labour and Social Affairs

One of the main questions of this paper is if this development has experienced rest of the regions. As written above there are 14 NUTS 3 regions in the Czech Republic. These regions have similar economic level with the exception of the capital city of Prague. However, their competitiveness is different (for more detailed analysis see [9]). We have chosen two regions with the lowest unemployment rate (Praha and Středočeský region) and two regions with the highest unemployment rate (Moravskoslezský and Ústecký region) for our analysis. The situation in the rest of the regions was similar – the real unemployment rate was remarkably lower than the natural rate of unemployment in the pre-crisis period. After the outbreak of the crisis in the real economy, the unemployment rate increased rapidly and was higher during the crisis compared with the natural rate of unemployment.

Fig. 2 Natural and real unemployment rate, Praha monthly data, 2005 – 2012

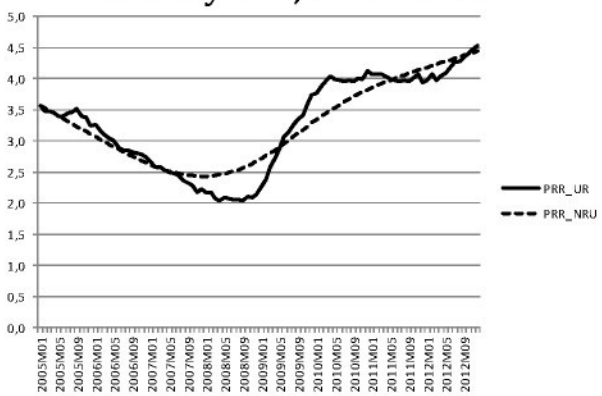
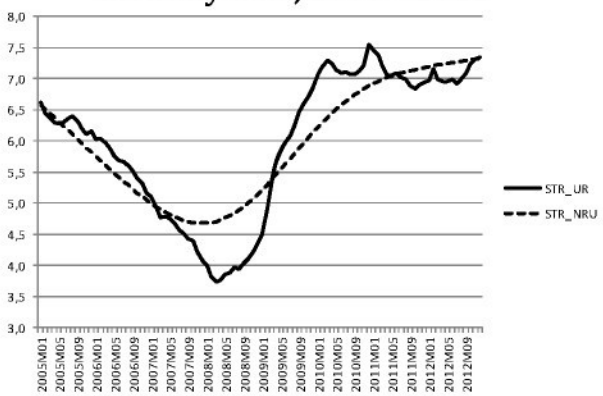


Fig. 3 Natural and real unemployment rate, Středočeský kraj monthly data, 2005 – 2012



Source: Czech Ministry of Labour and Social Affairs

The region of the capital city and Středočeský region were regions with the lowest both the UR and NRU (see figure 2 and 3). Economies of these two regions are mainly focused on the tertiary sector which consists of sectors with higher added value. Moreover, the labor force in the Praha region is significantly higher qualified in comparison with other regions (together with traditional skills and abilities of professional flexibility). Labour demand is very stable in Praha region and we can also argue that the development in the Praha was more stable during the observed period as results of the dominant position of the capital city with a high proportion of knowledge-based sectors. Středočeský region has an advantage that is based on its position which is closed to the capital city. This region is also attractive for direct foreign investment. Lower unemployment rate in comparison with other regions is mainly determined by the strong position of the automotive industry in this region.

Fig. 4 Natural and real unemployment rate, Moravskoslezský kraj, monthly data, 2005 – 2012

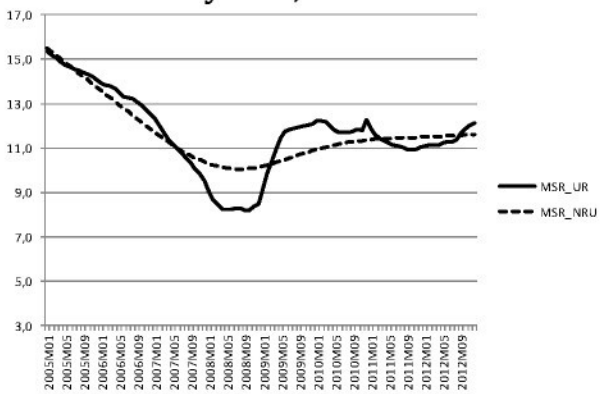
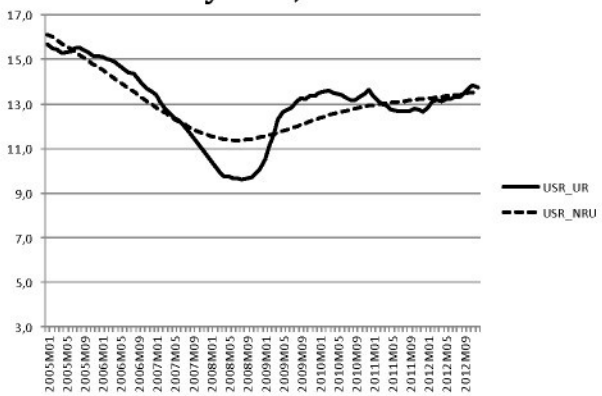


Fig. 5 Natural and real unemployment rate, Ústecký kraj, monthly data, 2005 – 2012



Source: Czech Ministry of Labour and Social Affairs

Figure 4 and 5 illustrates situation in the most problematic Czech regions – the Moravskoslezský and Ustecký regions. Economic transition and restructuring of production after 1989 (loss of some traditional industries and sectors – textile and clothing industry, mining and quarrying, some engineering fields, construction and chemical industry), among other things led to extensive changes in industry structure and changes in the distribution of economic activities of the regions´ economic base. In the same period, there was also a significant reduction in employment in the primary sector and partly in the secondary sector, increased employment in services. However, this process was problematic in comparison with other regions. Firstly, both the real unemployment rate and the natural rate of unemployment were significantly higher than in other regions during the observed period. However, as seen from figure 3 deterioration of labour market performance did not have so dynamic development. Secondly, an interesting fact is that levels of both rates did not differ remarkable, especially in the pre-crisis period. It means that some structural problem still existed in these regions.

Conclusion

The aim of this paper was to examine influence of the economic crisis on the Czech economy, especially in the regions during the period 2005–2012. We compared

development of the unemployment rate and the natural rate of unemployment. We applied the Hodrick-Prescott filter (HP filter) for estimation the natural rate of unemployment. This method is quite frequently used to filter the trend and the cyclical time series. Research in this study is based on regional monthly data between the years 2005 and 2012 (registered unemployment rate) which were published by Ministry of Labour and Social Affairs. As is evident from the analysis the Czech labour market was in a relatively strong positive unemployment gap before the crisis of the real economy. We argue that the decline of labour market performance during the crisis was the first step to return to a state of long-term equilibrium. This argumentation may seem at least controversial, but if we look at the situation before the outbreak of the economic crisis, then we can see that the Czech economy was in a relatively strong expansion. This resulted in usage the production factors (especially labour) with the too much intensity in the Czech Republic, and it was untenable in the long-run view. We found out the difference between the estimated natural rate of unemployment and the unemployment differed among the regions. We found that the positive unemployment gap was lower in the problematic regions like the Ustecky and Moravskoslezsky region. These findings suggest that these regions still have to face some structural problems and the labour market is not as flexible as in the rest of regions. In addition, we also found that the natural rate of unemployment has shifted permanently higher in comparison with the pre-crisis period.

Acknowledgements

The research behind this paper was supported by the Student Grant System within the grant SGS/7/2012 "Influence of Regional Disparities on Business Environment".

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