



University of Zagreb  
FACULTY OF ECONOMICS AND BUSINESS  
Zagreb - Croatia

Trg J. F. Kennedyja 6  
10000 Zagreb, Croatia  
Tel +385(0)1 238 3333  
<http://www.efzg.hr/wps>  
[wps@efzg.hr](mailto:wps@efzg.hr)

## WORKING PAPER SERIES

---

Paper No. 06-06

Josip Tica  
Ljubo Jurčić

# A relative unit labor cost: case of accession countries



SVEUČILIŠTE U  
ZAGREBU



# A relative unite labor cost: case of accession countries

---

Josip Tica  
[jtica@efzg.hr](mailto:jtica@efzg.hr)

Ljubo Jurčić  
[ljurcic@efzg.hr](mailto:ljurcic@efzg.hr)

Faculty of Economics and Business  
University of Zagreb  
Trg J. F. Kennedyja 6  
10 000 Zagreb, Croatia

The views expressed in this working paper are those of the author(s) and not necessarily represent those of the Faculty of Economics and Business – Zagreb. The paper has not undergone formal review or approval. The paper is published to bring forth comments on research in progress before it appears in final form in an academic journal or elsewhere.

**Copyright 2006 by Josip Tica, Ljubo Jurčić**

All rights reserved.

Sections of text may be quoted provided that full credit is given to the source.

### **Abstract**

In this paper, framework of the relative labor cost has been used in order to analyze relative competitiveness of the economic agents in the Croatia and five accession countries. Therefore, unit labor costs have been calculated for the Croatia, Czech Republic, Hungary, Poland, Slovakia and Slovenia. All of the analyzed countries are transition countries, on the similar level of GDP per capita, and are or will be in the near future EU members. Therefore, it is more than obvious that all of the analyzed countries will be direct competitors in the common European markets. Our findings suggest that relative unit costs (competitiveness) of Croatia *vis a vis* analyzed countries increased since 1996.

### **Keywords**

competitiveness, relative unit labor costs, productivity, wages, employment

### **JEL classification**

F41, E24

### **Sažetak**

Konkurentnost Hrvatske i pet novopridruženih članice EU je analizirana u ovom radu u okviru teorije relativnih jediničnih troškova rada. Jedinični troškovi rada su izračunati za Češku, Hrvatsku, Mađarsku, Poljsku, Slovačku i Sloveniju. Sve zemlje u uzorku su tranzicijske zemlje, slične razine razvijenosti i članice su EU ili su na putu ka pridruženju u europske integracije. Stoga je za očekivati da će navedene zemlje biti ili već jesu snažni izravni konkurenti ne zajedničkom EU tržištu. Rezultati naših istraživanja ukazuju na činjenicu da je od 1996. godine konkurentnost Republike Hrvatske relativno porasla u odnosu na većinu analiziranih zemalja.

### **Ključne riječi**

konkurentnost, relativni jedinični troškovi rada, produktivnost, plaće, zaposlenost

### **JEL klasifikacija**

F41, E24

## 1. Introduction

Throughout the twentieth century, the mainstream measure of competitiveness in international economics has been real exchange rate. The hypothesis of purchasing power parity simply implies that the real exchange rate will be stationary in the long run. According to the PPP theory, under assumption of perfect competition, international trade will have effect of equalizing prices for the same good in different countries since profits can be made by transporting a good from a location where the price is low and selling it where the price is high. Under perfect competition price will be equal to marginal costs, marginal costs will be equalized in all countries and there will be no supernormal profits.

Under assumption of imperfect competition most tradable goods and services are differentiated products and producers pursue pricing strategies to maximize their long-run profits. Therefore, when it comes to foreign markets, firms will use world pricing in order to set their prices at the international level. In other words, export companies will set their prices based on the prices of similar products produced abroad and their profit margins will squeeze or expand accordingly. In such imperfect market environment, a rise in domestic costs will have no effect on the export prices, higher costs will be simply accommodated with smaller profits. In this case there is no change in the price competitiveness of exports (real exchange rate), but there is an effect on the exporter's ability to compete.

Squeezed profits result in relative disadvantage in company's access to internal finance to fund future investments, marketing, research and development, or after-sales service. In the imperfect competition, higher costs will have no effect on price competitiveness, but "non-price" competitiveness will be reduced. Therefore in this case a definition of competitiveness and the real exchange rate based relative costs rather than relative prices are appropriate. One commonly used measure of competitiveness is called relative unit labor costs or RULC and is defined as ratio of relative productivity and wages between trading partners.

In this paper, framework of the relative labor cost has been used in order to analyze relative competitiveness of the economic agents in the Croatia and five accession countries. Therefore, unit labor costs have been calculated for the Bulgaria, Croatia, Czech Republic, Hungary, Poland, Romania, Slovakia and Slovenia. All of the analyzed countries are transition countries, on the similar level of GDP per capita, and are or will be in the near future EU members. Therefore, it is more than obvious that all of the analyzed countries will be direct competitors in the common European markets.

The entire transitional period has been analyzed and availability of data has impaired our analysis quite significantly and there is not any monthly data on RULC in the period prior to September 1999 and yearly data on RULC prior to 1994.

## 2. Data

Two main sources of data were used in order to compile database required for calculation of relative unit labor costs in Croatia, Czech Republic, Hungary, Poland, Slovakia and Slovenia. Analysis on yearly frequency was based on data for GDP (LCU), industrial value added (LCU), employment (industry and total), and official exchange rates of USD (LCU) acquired from World Development Indicators (2005) and data for average gross wages acquired from Wirtschaft International Institute Wien (2006). Due to availability of data construction of RULC with yearly data is possible only for the period between 1994 and 2002. Furthermore, due to series lack of data Romania and Bulgaria are completely excluded from analysis with yearly frequency.

Monthly data for the analysis, industrial production, average gross wages (€), employees in industry, as well as productivity in industry were acquired from Wirtschaft International Institute Wien (2006) monthly database. Due to availability of data (data for average monthly employment in industry in Croatia starts in September 1999), construction of RULC indicator is possible only for the period between September 1999 and June 2006.

## 3. Methodology

The relative unit labor cost indicator for Croatia is constructed as a ratio of unit labor cost of country  $x$  and unit labor cost of Croatia (Carlin i Soskice 2006, p. 296-298):

$$(1) \quad RULC = \frac{ULC_x}{ULC_{HRV}}$$

A rise in relative labor cost index is interpreted as increase in competitiveness of Croatia and decrease of relative labor costs is interpreted as decrease of competitiveness of Croatia compared to country

x. It is important to notice here that equation can also be reversed with unit labor costs of Croatia in the numerator and unit labor costs of country x in denominator. In that case interpretation of increase and decrease of index is opposite as well: increase of RULC is loss of competitiveness and *vice versa* (Griffiths i Wall 1995, p. 20). In both cases relative changes of index are exactly the same, and as it is the case with nominal and real exchange rates, the choice of denominator and nominator are matter of personal preferences. In this research, Croatian ULC is in denominator in order to make this analysis compatible with analysis of real exchange rates. Therefore, as it is the case with exchange rates, increase of indicator is increase of competitiveness (Carlin i Soskice 2006, p. 296-298).

Unit labor costs of all five countries were calculated as ratio of average gross wages (W-wages, E-nominal exchange rate) and average productivity (Y/L):

$$(2) \quad ULC = \frac{W * E}{Y / L}$$

Total factor productivity is not used due to the problems with data on capital and controversies related to the explicit form of aggregate productivity function. Three different proxies for average productivity were used. Yearly data series use two measures of productivity: ratio of industrial value added and number of employees in industry and ratio of GDP and total number of employees. Monthly data series use ratio of industrial production and number of employees in industry.

#### 4. Results

In the analysis with yearly data, two different index of productivity were constructed: relative unit labor cost for industrial sector and relative labor cost for total economy. Due to availability of data, relative labor unit cost for the total economy covers much longer time span. In the analysis with monthly data, only one index, relative unit labor costs of industry is constructed.

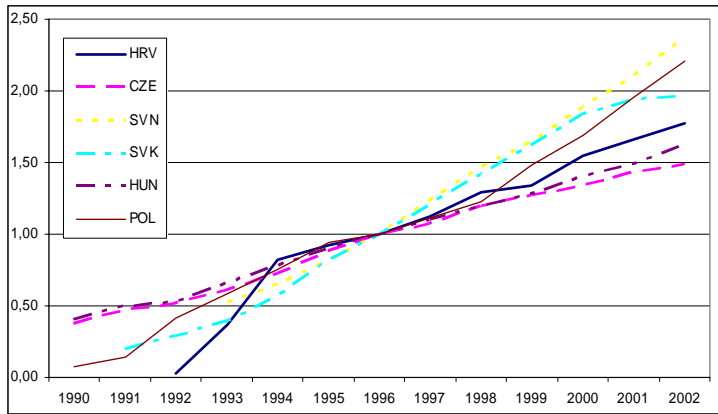
##### 4.1. RULC with yearly frequency

Between 1996 and 2002 fastest growth of productivity is recorded in Slovenia where productivity more than doubled. Slovakia is country with slowest productivity growth of total economy. Compared to analyzed countries, Croatian increase of productivity of total economy is slightly below average. Compared to 1996 level, productivity is 77% larger; during the same period productivity increased 137% in Slovenia, 121% in Poland, 97% in Slovakia, 62% in Hungary and 49% in Czech Rep (Figure 1).

Compared to 1996, in 2001 average productivity of industrial sectors increased the most in Slovenia 175% and slowest in Hungary 17%. As in the case of productivity of total economy, Croatian growth is in between amounting 46%. Poland increased 100%, Slovakia 79%, Czech Rep. 36% (Figure 2).

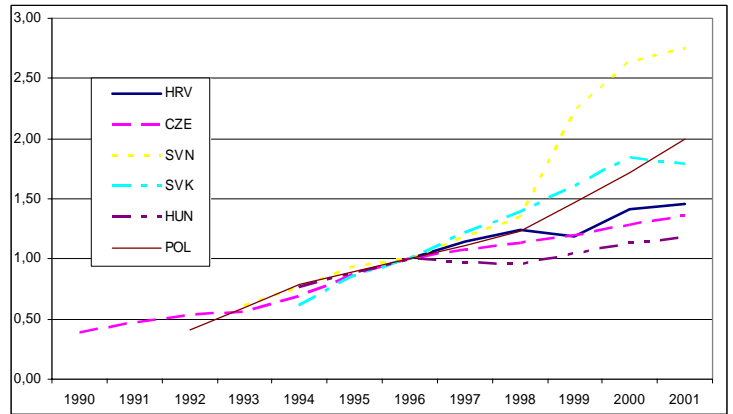
Average gross wages in USD, between 1996 and 2005 increased fastest in Hungary 207% and Poland 153%. Smallest increase is recorded in Croatia 87% and Czech Rep. 90%. Slovenian average gross wages increased 128% and Slovakian 112%. Compared to period between 1996 and 2002, increases are larger, but relative ranking of countries is exactly the same (Figure 3).

Figure 1: Average productivity of total economy 1996=1



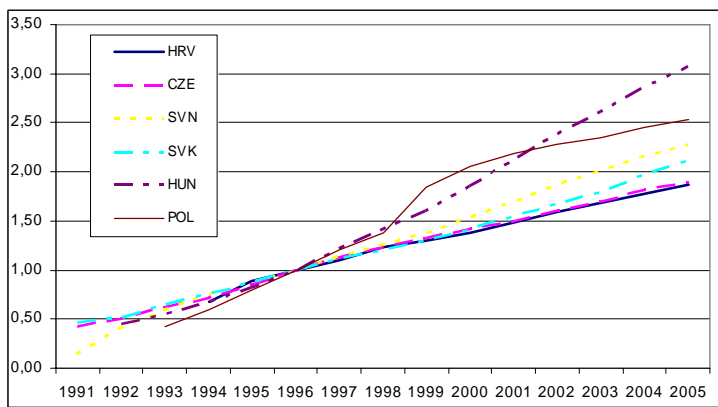
Izvor: WDI (2005)

Figure 2: Average productivity of industrial sector 1996=1



Izvor: WDI (2005)

Figure 3: Average gross wages total economy 1996=1



Izvor: WIIW (2006)

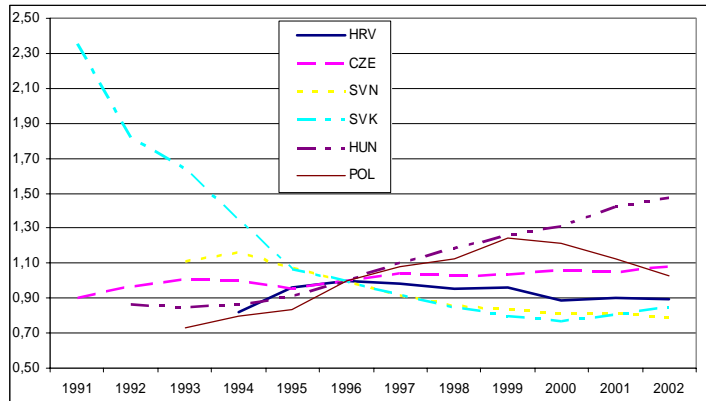
Unit labor costs of total economy in 2002, compared to 1996 increased the most, 47% in Hungary and the least in Slovenia -21%. Once again performance of Croatian economy is quite average with decrease of 10%. Czech Rep. (8%) and Poland (3%) experienced relative loss of competitiveness, while Slovakia joined Slovenia and Croatia with a decrease in costs of 15% (Figure 4).

Unit labor costs of industrial sector in 2001, compared to 1996 shows quite similar dynamics as total economy. Increase in unit labor costs is recorder in Hungary 81%, Poland 10%, Czech Rep. 10% and Croatia 2%. Decrease in unit labor costs is recorder in Slovakia 13% and Slovenia 38% (Figure 5).

Between 1996 and 2002, relative unit labor costs and/or competitiveness of Croatia increased relative to Hungary 64%, Czech Rep. 20% and Poland 15% and decreased relative to Slovakia 5% and Slovenia 12%. Analysis of relative unit labor cost is even more interesting if period prior to 1996 is analyzed. It is obvious that Croatia experienced tremendous drop in competitiveness *vis a vis* all the analyzed, with exception of Poland. Between 1994 and 1996, competitiveness of Croatia decreased 63% relative to Slovakia, 42% relative to Slovenia, 21% relative to Czech Rep. and 5% relative to Hungary. Throughout entire analyzed period, competitiveness constantly deteriorated relative to Slovakia and Slovenia. Relative to other countries competitiveness start improving after initial shock in pre 1996 period (Figure 6).

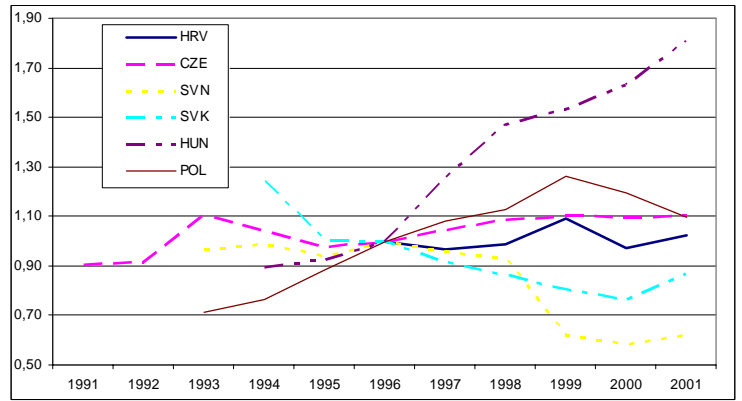
Relative unit labor costs of industry moved similarly as relative unit labor costs of total economy. Competitiveness of Croatia increased relative to Hungary 85%, Czech Rep. 13% and Poland 12%. Relative unit labor costs decreased relative to Slovenia 47% and Slovakia 11%. Analysis of movements of five bilateral competitiveness indexes shows that there is a strong trend toward decrease relative to Slovenia and Slovakia and increase relative to Hungary. Relative to Poland and Czech Rep., index of competitiveness shows relatively stationary movements (Figure 7).

Figure 4: Unit labor costs of total economy 1996=1



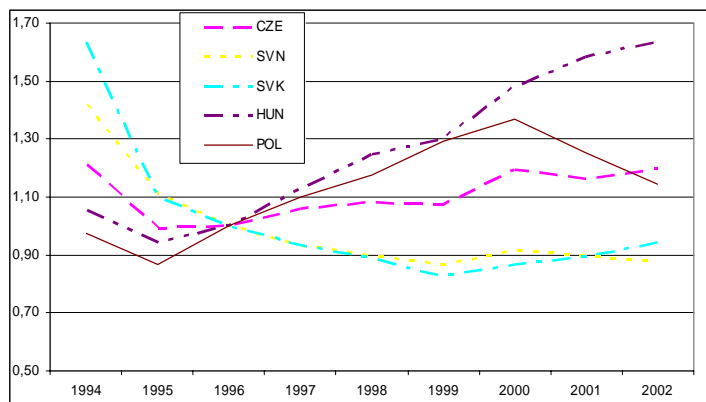
Izvor: WDI (2005)

Figure 5: Unit labor costs of industrial sector 1996=1



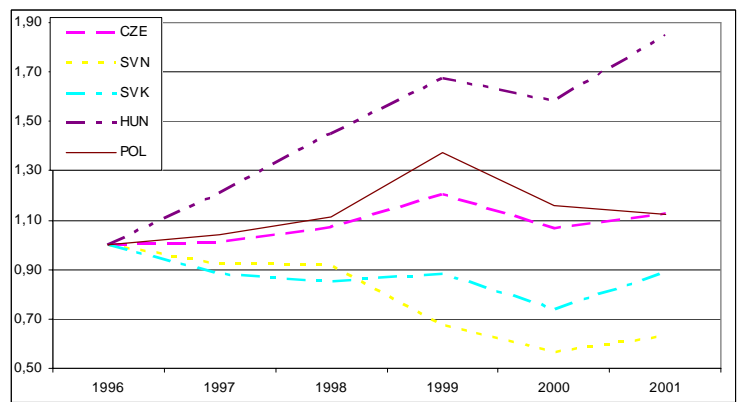
Izvor: WDI (2005)

Figure 6: Relative unit labor costs of total economy 1996=1



Izvor: WDI (2005)

Figure 7: Relative unit labor costs of industrial sector 1996=1



Izvor: WDI (2005)

#### 4.2. RULC with monthly frequency

Due to the fact that employment data on monthly basis in Croatia are available since September 1999, relative unit labor costs are analyzed since that point in time. Another reason is the fact that pre 2000 period is quite thoroughly analyzed on yearly data.

Average gross wages are expressed in Euros in the analysis on monthly data. Since September 1999, wages increased 109% in Hungary and Czech Rep., 101% in Slovakia, 67% in Croatia, 52% in Poland and 39% in Slovenia (Figure 8).

During the same period, index of industrial production increased 70% in Czech Rep., 55% in Slovakia, 49% in Hungary, 38% in Croatia and 28% in Slovenia. Data on industrial production of Poland are not available (Figure 9).

Between September 1999 and June 2006, number of employees in industry decreased in all analyzed countries, 14% in Poland, 13% in Croatia, 11% in Slovenia, 10% in Hungary, and 5% in Czech Rep. Data on number of employees in Slovakia are not available (Figure 10).

Data on industrial production in Poland and number of employees in industry in Slovakia are not available; therefore data of productivity in industry are used in order to estimate relative unit labor costs (Table 1).

Table 1: Availability of data

	HR	CZ	HU	PL	SK	SL
Industrial production	+	+	+	-	+	+
Employees industry	+	+	+	+	-	+
Wages industry	+	+	+	+	+	+
Industrial productivity	+	-	-	+	+	+

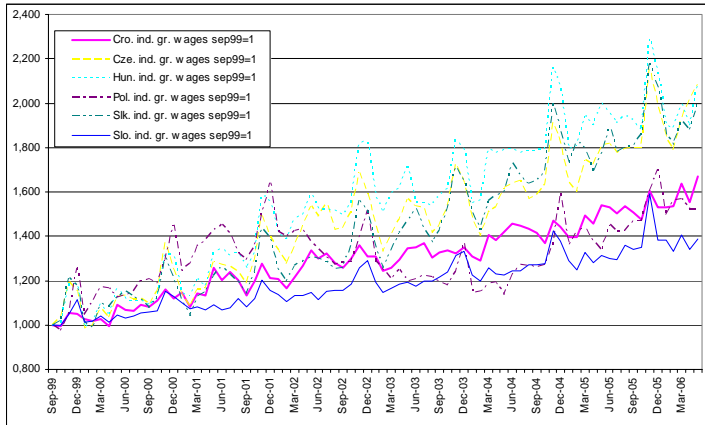
Izvor: WIIW (2006)

In the analyzed period unit labor costs increased 30% in Slovakia, 26% in Hungary, 17% in Czech Rep. and 6% in Croatia. In Slovenia and Poland, unit labor costs decreased 4% and 9%. These results are quite similar to the analysis with yearly data. Croatia is in the middle of the countries in the sample. The only exception compared to previous analysis is the fact that Poland and Slovakia switched places. In the present decade Poland is improving its competitiveness while Slovakia is not doing as great as it used to in yearly data analysis (Figure 11).

Accordingly, relative unit labor costs of Croatia increased relative to Slovakia 23%, Hungary 19%, Czech Rep. 11% and decreased relative to Slovenia 8% and Poland 13% (Figure 12). Countries in the analyzed sample are not trading partners of Croatia as much as they are competitors of Croatia on the joint European and World market. Therefore, instead of trade-weighted multilateral relative unit labor costs, average relative labor costs are calculated. Between September 1999 and June 2006, average relative unit labor costs of Croatia relative to five analyzed countries increased 3.2% (Figure 13).

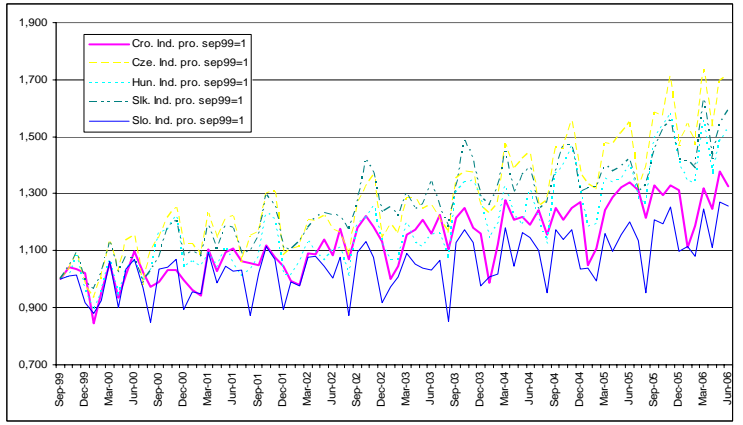


Figure 8: Average gross wages in industry (€) 1999:9=1



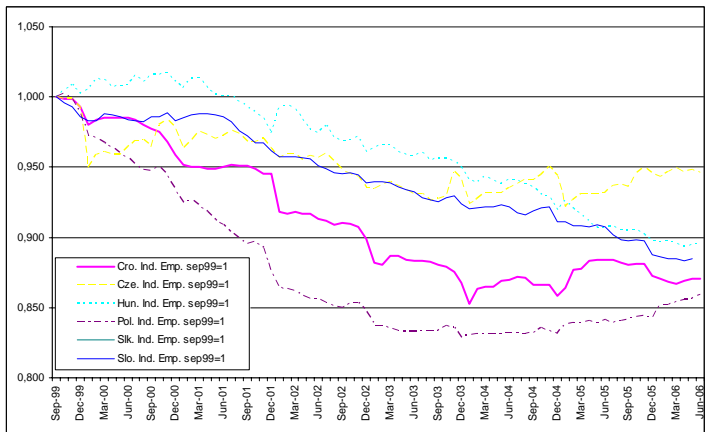
Izvor: WIIW (2006)

Figure 9: Industrial production 1999:9=1



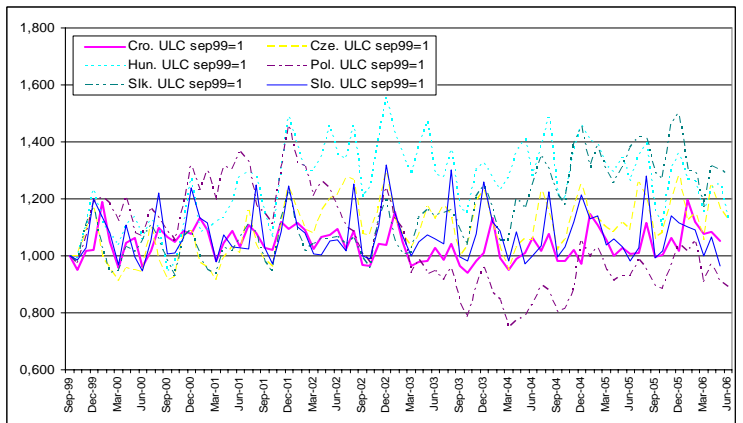
Izvor: WIIW (2006)

Figure 10: Employees in industry 1999:9=1



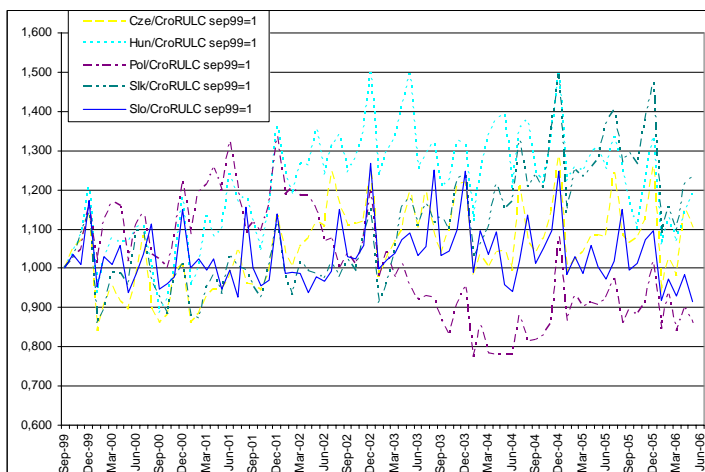
Izvor: WIIW (2006)

Figure 11: Unit labor costs in industry 1999:9=1



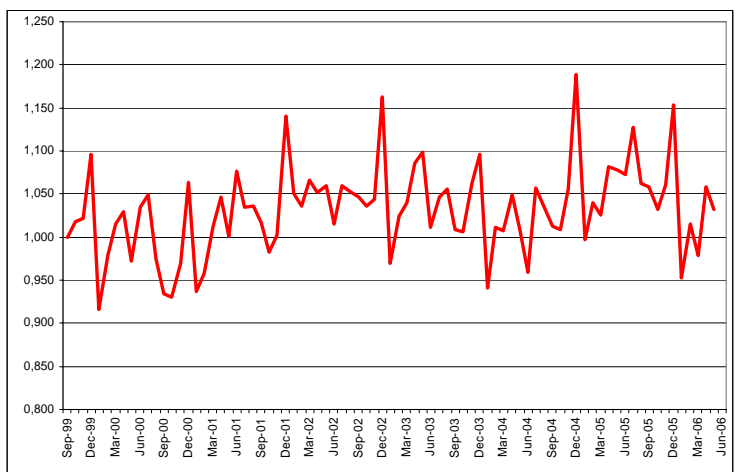
Izvor: WIIW (2006)

Figure 12: Relative unit labor costs in industry 1999:9=1



Izvor: WIIW (2006)

Figure 13: Avg. relative unit labor costs in industry 1999:9=1



Izvor: WIIW (2006)

## 5. Conclusion

Analysis of movements of the relative unit labor costs suggests the following conclusions. After strong collapse in competitiveness of Croatia during 1994 and 1995, relative unit labor costs became less volatile. In general, trends in competitiveness changed in 1996, and improvements occurred. Between 1996 and 2001/02 Croatia improved competitiveness relative to Hungary, Poland and Czech Rep. In the later period, after 2000/01 improvements continued relative to Hungary, Czech Rep., and positive trend emerged relative to Slovakia. Throughout entire analyzed period competitiveness of Croatia relative to Slovenia has been eroding constantly. Relative to Slovakia, competitiveness eroded until the end of nineties, and relative to Poland erosion started recently.

Obviously, growth of gross wages in Croatia is moderate compared to sample countries, growth of industrial production is second lowest (only Slovenia has lower growth) and decrease of industrial employment is second largest (only Poland decreased employment in industry more than Croatia). Combined movements of employment, output and wages result in quite mediocre improvements in competitiveness of Croatia, which sums up to 3.2% in average during last seven years.

Conclusion that with exception of Poland and Slovenia competitiveness of Croatia increased in general during last seven years should be taken with strong reservation. The most important reservation regarding the conclusion is the fact that RULC can be used as measurement of competitiveness only for the imperfect market structure. Therefore, increase of 3.2% in relative unit labor costs is good news for the high value added exporting companies, which are on the verge of profitability. Furthermore, it is improvement of attractiveness of Croatia as destination for outsourcing from more developed countries of EU. Agricultural, fisheries and mining sectors or any industry with low value added in production are generally much closer to perfect competition markets and relative real exchange rates can be much better measure of competitiveness. Basic rule is the higher value added the more imperfect market, or in our case more value added more RULC and less REER.

The quality of data slightly undermines reliability of results. The fact that data series for working hour's adjusted productivity in industry are not available in all countries definitively raises strong doubts on such a small increase in competitiveness. Therefore, the most exact interpretation of the result is that competitiveness of Croatia most probably increased in average, but the size of increase is small relatively to potential size of errors in data set.

## Literature

- 1) Carlin, W., Soskice, D. (2006): *Macroeconomics, Institutions & Policies*, Oxford University Press , Oxford.
- 2) Griffiths, A, Wall, S. (1995): *Applied Economics, An Introductory Course*, 6th Edition, Longman, London i New York.
- 3) WDI 2005, *World Development Indicators*, United Nations.
- 4) WIIW 2006, *WIIW Monthly database on Eastern Europe*, Vienna Institute for International Economic Studies.