REGIONAL DIFFERENCES IN UNEMPLOYMENT: THE CASE OF CROATIA

Paper prepared for the
43rd Congress of the European Regional Science Association, Jyväskylä, Finland,
August 27-30th, 2003.

Valerija Botrić
Institute of Economics, Zagreb,
Trg. J.F. Kennedy 7, 10000 Zagreb, Croatia.
E-mail address: vbotric@eizg.hr.

Abstract

Most transition economies have gone through severe changes in the labour market during the 1990s. Under the previous socialist regime, unemployment was virtually non-existent due to the pronounced job security, which was also accompanied by low labour mobility. Studies indicate that one of the cornerstones of previous system was flourishing latent unemployment. The transition to the market economy was therefore connected with the process of revealing latent unemployment.

Not unlike other transitional economies, the first phase of transition in Croatia was marked by strong decrease in the rate of employment and simultaneously rising rate of unemployment, as labour market agents were more influenced by market-oriented philosophy. The policies designed to reduce the unemployment in Croatia so far have been concentrated on the overall number in the country. However, the available data indicates that some regions have persistently higher registered number of unemployed persons throughout the whole period. The paper investigates whether there are differences in the regional development of unemployment between Croatian regions or whether the national demand and supply conditions predominate region-specific determinants.

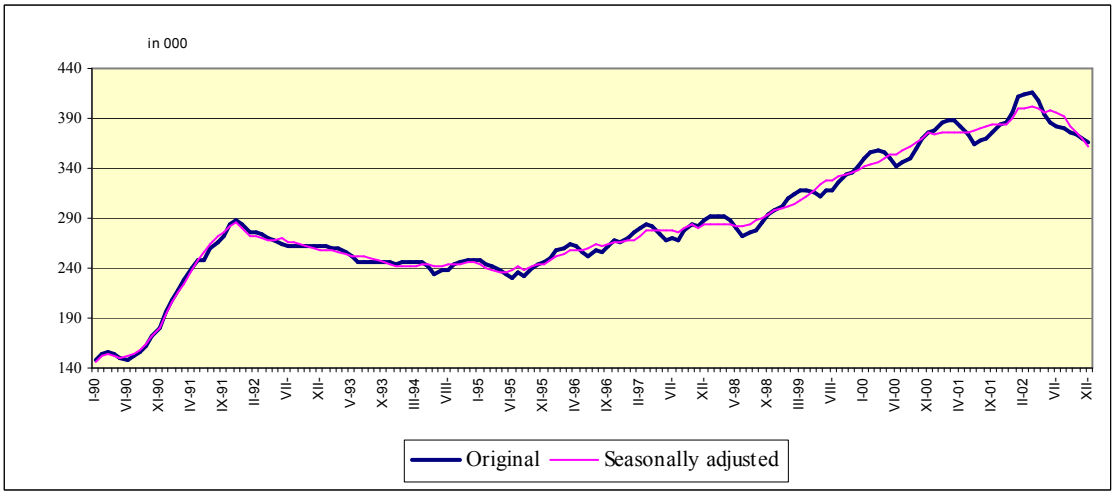
JEL Classification: R23, J64.

Key words: regional unemployment, unit roots, regression analysis, Croatia.

1. Introduction

High level of unemployment has been one of the most pronounced problems of the Croatian economy during the transition phase. The first part of the transition, characterised by the output drop and increasing inflation rates, produced enlarged number of unemployed. Although the war experience could be blamed for the more severe drop in output in comparison with other transition economies in the region[1], one might not conclude that the same was the issue with the unemployment. To be specific, the official number of employed persons did not register those employed by the police and army until the war was well over, so the overall employment data were underestimated. Since at the same time those officially or less officially at the battlefields could not meet the Employment Service regulations and check in their offices once every month, the unemployment data was also underestimated. In addition, the structural reforms at the labour market were also postponed, partly due to the war. Therefore, the full scale of the unemployment problem could not have been realised until the second half of the 90-ies, as the Figure 1 below indicates[2]. By that time, most of the other transition economies in the region have already implemented at least some of the measures to fight unemployment.

Figure 1. Unemployment level in Croatia during 1990-2002 period



Source: Croatian Employment Service.

The purpose of this paper is to empirically investigate whether there are significant differences between regional unemployment dynamics in Croatia since the

independence and whether there is a need to redesign the economic policy in a way to introduce region-specific measures. This issue has been severely debated in Croatia, but since at the same time there is a severe lack of empirical analysis at the regional level, the arguments were based almost exclusively on the anecdotal evidence. Specifically, there were arguments that due to the fact that war affected some of the regions more severely than the others, the overall economic activity in different regions must be correlated with the intensity of war destruction in the region. The paper will investigate whether the data confirms such beliefs.

The rest of the paper is organised as follows: Section 2 provides basic overview of the methodology and the data applied, Section 3 analyses the results and Section 4 concludes.

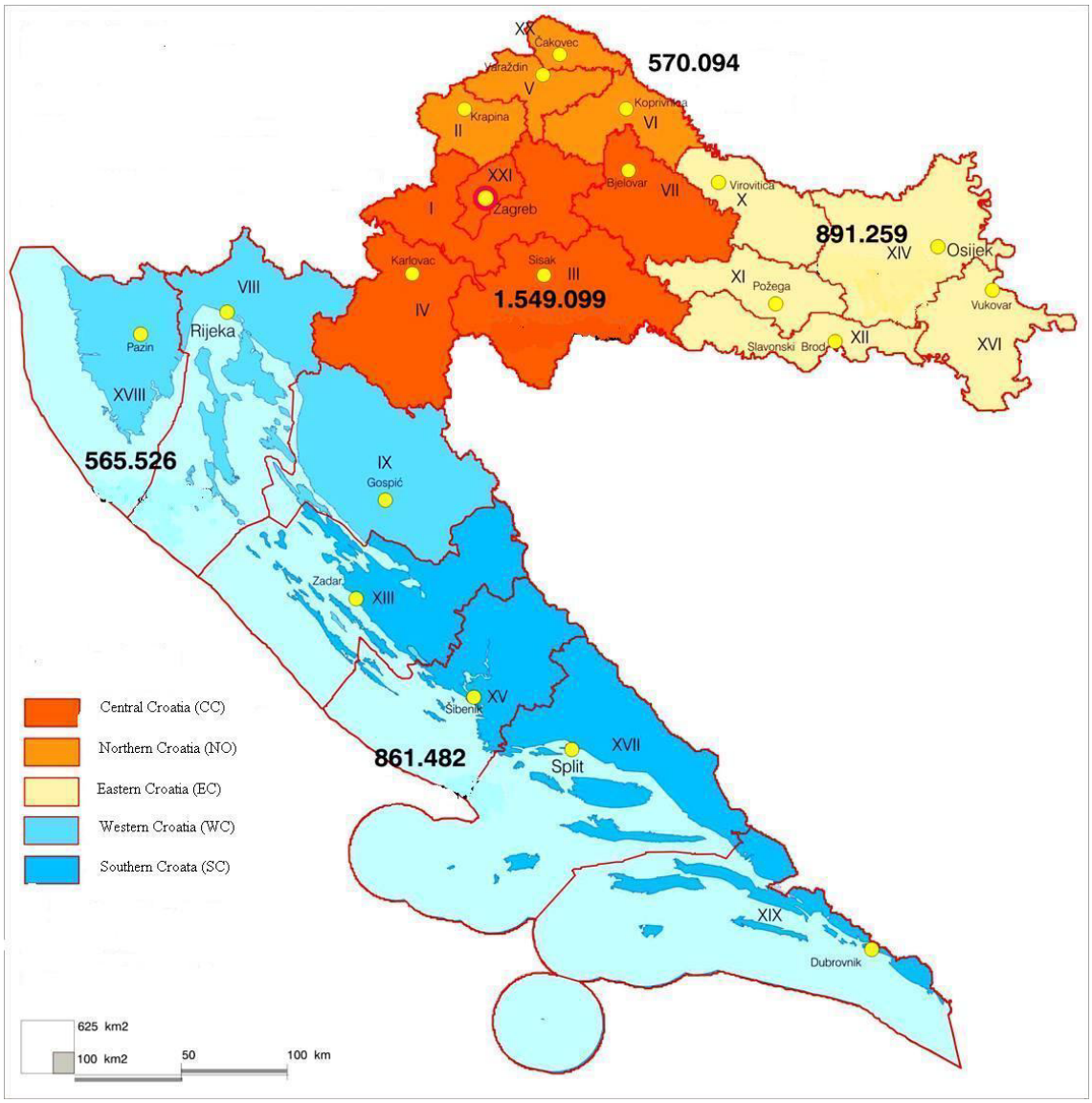
2. The Methodology and Data

Since the main objective was to determine whether there are differences in the regional unemployment patterns, and the recent empirical literature shows that there is no single appropriate procedure, we will approach it by estimating different types of models. The procedure follows the one outlined in Shepherd and Dixon (2002)[3], and consists of estimating following models:

1. Regressing each region on national data
2. Regressing each region on rest of nation unemployment data (national data excluding the region in question)
3. Region-national unemployment instrumental variable estimates
4. Using seemingly unrelated regressions.

Since the Croatian statistical system is in the reconstruction phase, there are significant data lacking problems. Although at least partial data is available on the county level, the number of counties in Croatia (21) is far too excessive for a qualitative analysis and differentiating between the national and regional specific developments in the labour market. However, the Central Bureau of Statistics has recently formulated a proposition for the introduction of the EUROSTAT nomenclature NUTS (The Nomenclature of Territorial Units for Statistics) in the Croatian statistical system, and the county data has been aggregated for the purpose of this paper according to the CBS proposition. The

Figure 2. Croatia according to NUTSII regions



Source: Central Bureau of Statistics.
The numbers indicate the population in each NUTSII according to the census 2001.

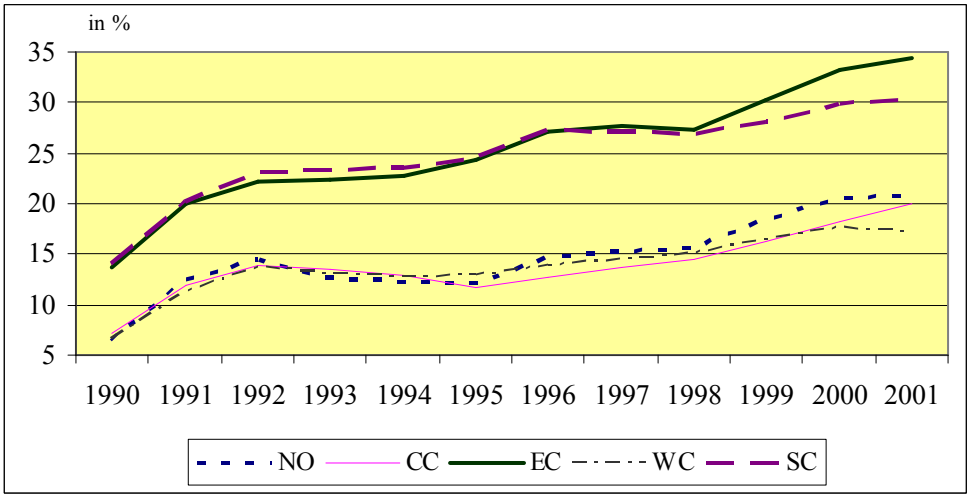
proposition states that the 21 Croatian counties should be aggregated in following NUTS II regions:

- Northern Croatia including following counties (NO): Krapinsko-zagorska, Varaždinska, Koprivničko-križevačka and Međimurska.
- Central Croatia including following counties (CC): Zagrebačka, Sisačko-moslavačka, Karlovačka, Bjelovarsko-bilogorska, Zagreb.
- Eastern Croatia including following counties (EC): Virovitičko-podravska, Požeško-slavonska, Brodsko-posavska, Osječko-baranjska and Vukovarsko-srijemska.
- Western Croatia including following counties (WC): Primorsko-goranska, Ličko-senjska and Istarska.

- Southern Croatia including following counties (SC): Zadarska, Šibensko-kninska, Splitsko-dalmatinska and Dubrovačko-neretvanska.

A comment must be made here. The above presented aggregation into the NUTSII regions has not yet been formally accepted. However, since this regionalisation could be considered as one respecting historical, social and economic differences of Croatian regions, it will be deemed applicable for the purposes of the research. Thus regionalised data indicates that the regions mostly affected by the war have throughout the 1990-2001 period experienced substantially higher unemployment rates than those in areas less affected by the war activities. Specifically, Eastern and Southern Croatia have faced distinctively stronger unemployment problems during the war period, which sustained after the war period as well. As the Figure 3 indicates, the overall dynamics in the unemployment rates across the regions is roughly the same throughout the period, regardless the specific unemployment rate level of the region. From this figure, one might presume that the national forces in the labour market strongly influence the path of the unemployment rates, while the level is determined by the regional factors.

Figure 3. Regional unemployment rates

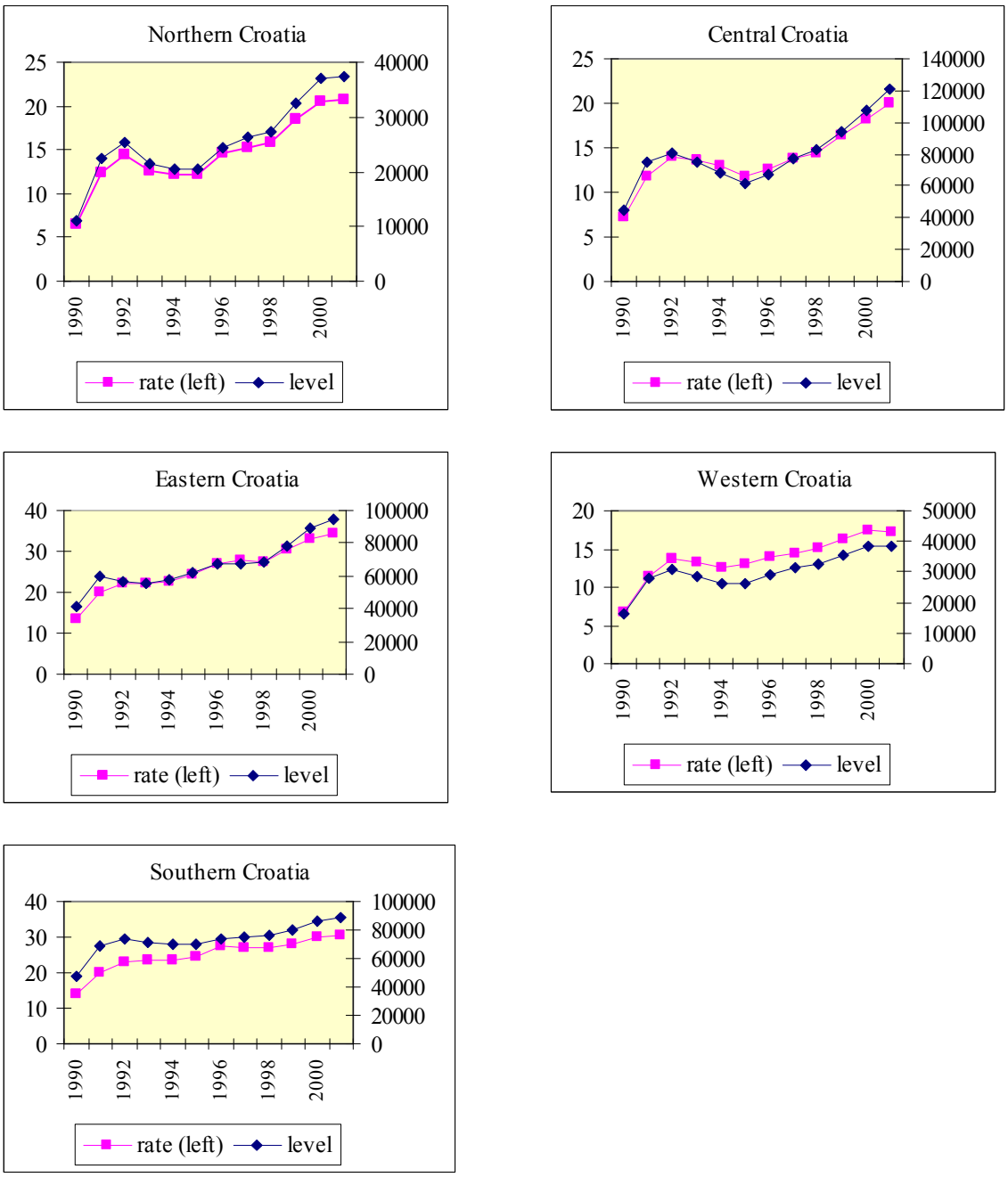


Source: Central Bureau of Statistics and Employment Service.
Annual unemployment rate at the NUTSII region level is calculated as the ratio between the average number of unemployed during the year, and the sum of average number of unemployed and the total number of employed (legal entities + crafts, trades and free lances) as of March 31st each year. Although the data doesn't correspond in terms of dates, the CBS performs the full coverage survey on employment only once a year, in March, and the data collected for this specific month is of much better quality than for the rest of the year.

The availability of the data influenced somewhat the decision to model the level of unemployment instead of unemployment rates, the latter being the usual approach in the

literature. Specifically, the Central Bureau of Statistics publishes the data on the number of employed at the county level in legal entities and in crafts, trades and free lances only annually[4], while the data on unemployment is available on monthly basis. However, since the analysed period is relatively short, there were no major changes in the labour force participation across the regions, in spite of the strong migrations. A crude analysis

Figure 4. Unemployment level and rate in different regions



Source: Central Bureau of Statistics and Croatian Employment Service.
The correlations between the annual unemployment level and rate data in each region is as follows: NO – 1.00; CC – 0.98; EC – 0.97; WC – 0.97; and SC – 0.95 all significant at 5% level.

of the data indicated that the level of unemployment could be used instead of the unemployment rates for the period in question. The unemployment level and rates patterns in NUTSII regions could be observed in the Figure 4.

In addition to the national unemployment data presented in Figure 1, all of the regional unemployment data were seasonally adjusted. Although there might be some interpretation problems with seasonally adjusted data regressions, there are significant differences between seasonal movements in the regional labour markets data in Croatia[5]. Therefore, it seemed justifiable to use the seasonally adjusted data for the analysis purposes. The analysed period throughout the paper is 1990:1 to 2002:12.

3. The Results

The general idea was to estimate regression equations using the traditional approach and some variation of this approach which would yield more plausible estimates. The first step in the analysis was to investigate the behaviour of the regional unemployment data in Croatia. Before the regression was applied, all of the series were tested for the presence of the unit root. Both the Dickey-Fuller (including augmented version) and Phillips-Perron test were conducted, and the results can be seen in Tables 1 and 2.

Table 1. ADF unit root tests for the unemployment data series

Series	Nor intercept or trend		Intercept		Intercept and trend	
	DF	ADF(4)	DF	ADF(4)	DF	ADF(4)
UNTOT	3.87	0.24	-2.69*	-2.72*	-1.44	-3.43**
NO	2.92	0.06	-2.21	-2.80*	-1.25	-3.55**
CC	3.92	-0.19	-1.79	-2.36	-1.03	-2.89
EC	3.54	1.18	-0.66	-1.83	-1.24	-2.87
WC	1.50	0.09	-3.52***	-3.18**	-0.62	-2.72
SC	2.97	0.79	-4.43***	-2.96**	-3.37*	-3.63**
ΔUNTOT	-4.67***	-2.47**	-4.87***	-2.59	-4.95***	-2.74
ΔNO	-5.68***	-2.56**	-5.90***	-2.62*	-5.99***	-2.74
ΔCC	-4.89***	-2.32**	-5.17***	-2.35	-5.21***	-2.38
ΔEC	-7.88***	-3.11***	-8.32***	-3.49***	-8.29***	-3.44**
ΔWC	-5.71***	-2.86***	-5.76***	-2.88**	-6.17***	-3.37*
ΔSC	-7.58***	-3.25***	-7.89***	-3.46**	-8.09***	-3.74**

Not being able to reject the unit root hypothesis *** 1% significance; ** 5% and * 10% significance.
UNTOT variable in all regressions stands for country data, and symbols for other variables are explained in Section 2.

Although not all applicable to the specific case, the variety of tests are presented, since the data for Croatia have not been systematically investigated so far, at least not at the regional level[6].

From the results of the Dickey-Fuller test presented in the Table 1 it can be seen that including the additional lags does not improve the estimation. The significance of lags was also more formally tested using the t-statistics, and on general they proved insignificant. As for the appropriate model, the theoretical assumption suggests that the specification including both trend and intercept should be preferred. However, formal testing procedure (t-tests were applied) reveals that series can be grouped according to the appropriate model into:

- series that should be tested excluding intercept and trend: UNTOT; NO; CC
- series that should be tested using intercept: SC; EC
- series that should be tested using intercept and trend: WC.

Regardless of the testing procedure, all of the specifications confirm the presence of the unit root process. To confirm the results, a Phillips-Perron test was also conducted. Due to the above mentioned results of no significance of lags, the results of Phillips-Perron tests are presented only for the specifications excluding lags.

Table 2. Phillips-Perron unit roots tests

Series	Nor intercept or trend	Intercept	Intercept and trend
ΔUNTOT	-4.68***	-4.69***	-4.95***
ΔNO	-5.68***	-5.90***	-5.99***
ΔCC	-4.89***	-5.17***	-5.21***
ΔEC	-7.88***	-8.32***	-8.29***
ΔWC	-5.71***	-5.76***	-6.17***
ΔSC	-7.58***	-7.89***	-8.09***
ΔΔUNTOT	-17.05***	-17.00***	-16.96***
ΔΔNO	-18.76***	-18.70***	-18.67***
ΔΔCC	-17.32***	-17.27***	-17.23***
ΔΔEC	-19.48***	-19.41***	-19.37***
ΔΔWC	-18.67***	-18.62***	-18.57***
ΔΔSC	-19.51***	-19.45***	-19.38***

Not being able to reject the unit root hypothesis *** 1% significance. The testing for levels is not presented since it yields the same results as ADF tests.

The results of both tests presented here indicate that all of the analysed series exhibit the presence of a unit root process. Namely, all of the series follow I(1) process. This argument is the reason why different methods were used in order to determine the

influence of regional-specific versus the national-wide shocks. Specifically, in the presence of a unit root, the traditional approach of regressing the regional on national data may contain spurious results.

In order to specify the appropriate regression and confirm the suitability of methodology proposed before, the Engle-Granger procedure was used to test for cointegration. Again, due to the lack of previous research, the testing results are reported rather extensively. They are presented in Table 3.

Table 3. Residual cointegration tests for unemployment data

A – by adding additional variables

	ADF(4)	1% critical value
UNTOT=f(NO)	-2.82	-3.73
UNTOT=f(NO,CC)	-2.69	-4.07
UNTOT=f(NO,CC,EC)	-3.06	-4.45
UNTOT=f(NO,CC,EC,WC)	-1.76	-4.75

B – between the variables

Dependent variables	Independent variables				
	UNTOT	NO	CC	EC	WC
UNTOT	-				
NO	-2.88	-			
CC	-2.04	-2.24	-		
EC	-1.69	-1.94	-1.83	-	
WC	-0.48	-0.94	-1.31	-1.49	-
SC	-2.69	-2.84	-2.75	-2.79	0.19

Residual unit root test 1% and 5% critical values are -3.73 and -3.17, respectively.

As the results in the table presented above indicate[7], there are no cointegrating relationships between the regional unemployment data. This implies that from the sample, one cannot conclude that the long-run unemployment in different Croatian regions follows the same, common trend. Having that in mind, one can proceed with regressions outlined in Section 2.

1. Regressing each region on national data

The first model is the traditional regression model in which each region is regressed on the national data. Although this procedure - due to the fact that the independent variable consists of the dependent variable - does not seem econometrically very sound, it is presented in this section for the comparison purposes with other regression methods

used. Furthermore, when the data consists of unemployment rates instead of unemployment level, it seems that this procedure is very common in empirical research. The fact that the research usually analyses unemployment rates, cannot be deemed justifiable or leading to any significant differences in results, since the overall unemployment rate is also derived by the computational methods from the unemployment and labour force data. A weighting issue should also be mentioned. The regions with relatively higher weight in the national data – in terms of the labour force if one is using the unemployment rates for regressions; or in terms of the unemployment data itself in our case – are expected to be strongly correlated with the national dynamics in the labour market and consequently produce misleading regression results. The problem would be bypassed if the regions were more equally distributed. However, one usually cannot expect from the economic data to behave nicely.

The fact that this model demonstrates estimation problems is confirmed by the data. Since the previous analysis of the data indicated that the series are non-stationary and not cointegrated, a model in which the relationship between the each region and national data is examined is specified in terms of first differences. The results are presented in Table 4.

Table 4. Region-national unemployment level OLS estimates

	C	ΔUNTOT	R^2	LM(1)	LM(2)	DW
ΔNO	13.46 (0.42)	0.11* (14.04)	0.56	2.35	3.65	1.74
ΔCC	51.51 (1.01)	0.31* (24.72)	0.80	9.93	11.24	1.47
ΔEC	20.13 (0.33)	0.23* (15.46)	0.61	1.49	3.45	1.79
ΔWC	-63.26* (-2.02)	-0.12* (15.18)	0.60	4.35	4.41	1.65
ΔSC	-0.79 (-0.01)	0.21* (-16.20)	0.63	1.22	1.48	1.77

5% critical values for the Breusch-Godfrey autocorrelation tests are 3.84 for LM(1) and 5.99 for LM(2).
t-values are reported in parentheses beneath each regression coefficient.
All the coefficients significant at 5% level are marked by * in all the following regression results tables.

The reported Breusch-Godfrey statistics indicates that some of the regressions reveal autocorrelations and others do not. Even though this type of estimation suffers from statistical problems, it can be seen that not all of the variation in the unemployment in each region can be explained by the movements in the national unemployment. The

degree of the influence is different across the regions, with the largest region (Central Croatia) in terms of economic activity and the average number of unemployed during the sample period being most strongly interrelated with the overall movements. The further analysis will show that the impact of the national forces on the regional unemployment dynamics is exaggerated in the standardised OLS estimates.

2. Regressing each region on rest of nation unemployment data (national data – region)

In order to improve the ability to draw the conclusions from simple regressions, in the second stage of the analysis from the total number of unemployed (national data) the regional data for which the estimation is carried out is subtracted, and the OLS procedure is applied once again. Since the new series (national data excluding region) follows a slightly different seasonal pattern, the seasonal adjustment procedure has been carried through once again. The regression results are presented in Table 5.

Table 5. Region-rest of nation unemployment level OLS estimates

	C	Δ(TOT-region)	R^2	LM(1)	LM(2)	DW
ΔNO	30.56 (0.86)	0.11* (11.43)	0.46	4.15	6.47	1.67
ΔCC	135.69 (1.92)	0.38* (15.35)	0.61	16.19	18.41	1.35
ΔEC	99.17 (1.31)	0.23* (9.70)	0.38	0.93	1.90	1.83
ΔWC	-53.54 (-1.50)	0.12* (12.07)	0.49	5.75	6.39	1.60
ΔSC	48.29 (0.76)	0.22* (11.21)	0.45	1.54	1.55	1.75

5% critical values for the Breusch-Godfrey autocorrelation tests are 3.84 for LM(1) and 5.99 for LM(2).
t-values are reported in parentheses beneath each regression coefficient.

Similar to the regressions results for the Australian unemployment rates data reported in Shepherd and Dixon (2002), the coefficients in the second case are slightly lower than in the first one (with the exception of Northern Croatia). At the same time, the overall coefficient of determinations in the second regressions are lower than in the first, for all of the regions, confirming that the results were at least somewhat biased in the first case. However, the autocorrelation remains to be a problem in this model, and the estimation technique is not that much improved. The question of weighting has to be considered once more. If the region that is marked as the dependent variable in the regression represents the largest part of the total unemployment, then it cannot be assumed that other regions adequately proxy the national dynamics. In our case, the

Central Croatia is the region, confirmed by the regression results, mostly correlated with the national dynamics. The decrease in the coefficient of determination between the first and second case regressions confirms that, after subtracting the Central Croatia from the overall unemployment data, the explanatory power of other regions fade considerably. However, Central Croatia is not the only region experiencing such developments. The assumption that weighting has to be the reason behind such movements is confirmed by the fact that other regions with the largest number of unemployed, Eastern and Southern Croatia, have also strong decrease in coefficient of determination between the first and second regressions.

3. Region-national unemployment IV estimates

In the next stage of the analysis, individual regional unemployment data excluding the region being the dependent variable in regression were used as instruments for the national unemployment. Since the fundamental assumption of the regression analysis is that the dependant variable is uncorrelated with the disturbance term, obviously this type of regression will still suffer from the bias problem. However, the bias should be smaller than in the previous two estimated regression cases. The results are shown in Table 6.

Table 6. IV unemployment level estimates

	C	Δ(UNTOT)	GR^2	R^2	LM(1)	LM(2)	DW
ΔNO	26.67 (0.82)	0.10* (12.64)	0.46	0.56	3.83	5.91	1.68
ΔCC	90.78 (1.75)	0.28* (21.50)	0.62	0.79	13.94	15.91	1.39
ΔEC	77.17 (1.24)	0.19* (12.04)	0.39	0.59	0.88	1.68	1.84
ΔWC	-51.55 (-1.64)	0.11* (13.88)	0.51	0.60	5.84	6.14	1.59
ΔSC	36.93 (0.69)	0.18* (13.60)	0.46	0.62	1.34	1.43	1.76

5% critical values for the Breusch-Godfrey autocorrelation tests are 3.84 for LM(1) and 5.99 for LM(2).
t-values are reported in parentheses beneath each regression coefficient.

In addition to the usual coefficient of determination, a generalised version proposed by Pesaran and Smith (1994) is also reported[8]. Since they argue that the coefficient of determination based on IV residuals cannot provide a valid model selection criterion, because there exists dependence of the residuals on the endogenous variables, an

analysis is based on the generalised measure. The ordinary coefficient of determination is reported for comparison purposes, but also as a representation of a way in which the usual tests could lead to misleading conclusions.

Generalised measure, being lower than in previous cases, confirms that the results previously obtained by ordinary least squares contain at least some spurious regression. The tests for the autocorrelation were performed for the regressions obtained by the IV estimates technique, and they confirmed once again that some of the regressions do exhibit serial autocorrelation. The significance of lag in each regression was also tested, and in those regressions demonstrating the serial autocorrelation, up to 2 lags were found significant at the 5% level. However, since the inclusion of lags did not prove significant in general, the VAR model was not estimated.

4. Seemingly unrelated regressions

All of the above methods tried to establish a relationship between the regional and the national unemployment data, the difference being only whether the national data were proxied by regional data or not. However, this type of regression does not take into account the possible interrelations between the regions. One of the ways to include this type of relations is by applying seemingly unrelated regression method, which in this case consists of a set of equations estimates in which the unemployment in each region is related to the unemployment in all of the other regions. Results are reported in Table 7.

Table 7. SUR unemployment level estimates

	ΔNO	**ΔCC**	**ΔEC**	**ΔWC**	**ΔSC**	**R^2**	**DW**
ΔNO	-	0.18* (5.08)	0.10* (2.81)	0.29* (3.77)	-0.01 (-0.13)	0.46	1.77
ΔCC	0.72* (5.08)	-	0.41* (6.25)	0.80* (5.51)	0.25* (3.04)	0.60	1.38
ΔEC	0.46* (2.81)	0.48* (6.25)	-	-0.52* (-2.93)	0.31* (3.29)	0.36	1.73
ΔWC	0.27* (3.77)	0.19* (5.51)	-0.10* (-2.93)	-	0.23* (5.80)	0.50	1.55
ΔSC	-0.02 (-0.13)	0.20* (3.04)	0.21* (3.29)	0.79* (5.80)	-	0.45	1.89

t-values are reported in parentheses beneath each regression coefficient.

From the results reported in Table 7., one can notice that the coefficient of determination for each equation is not much different from the generalised R^2 in the IV estimates. At the same time, both are smaller than the ones reported for the OLS estimates. This leads to the final conclusion that the standard OLS estimates exaggerate the influence of the national forces in the regional unemployment dynamics. Therefore, in order to determine whether the national forces or the regional ones predominate, the most appropriate methods seem to be the IV regressions or the SUR regressions. To help to decide between the two, one must look up the regression residuals in the SUR estimates. If they show evidence of significant contemporaneous correlation, then they should be preferred in the analysis, since they make use of the interregional relationships in the data as well. Table 8. provides the insight to the correlation of the disturbances significance.

Table 8. Residual correlation matrix

	ΔNO	**ΔCC**	**ΔEC**	**ΔWC**	**ΔSC**
ΔNO	1.00	-0.37	-0.25	-0.33	0.11
ΔCC	-0.37	1.00	-0.51	-0.41	-0.14
ΔEC	-0.25	-0.51	1.00	0.41	-0.33
ΔWC	-0.33	-0.41	0.41	1.00	-0.53
ΔSC	0.11	-0.17	-0.33	-0.53	1.00

In addition, both the likelihood ratio statistics and Breusch and Pagan Lagrange multiplier statistics confirm that the covariance matrix of disturbances is not diagonal, and therefore the errors are contemporaneously correlated. In revealing whether the unemployment patterns in Croatian regions are region-specific or the national dynamics predominate, the most suitable model should therefore be the last one.

Looking at the results of the exercise, one can conclude that the data suggests that regions could be divided into 3 groups:

- regions under the stronger influence of the national level unemployment dynamics (Central Croatia),
- regions under the influence of the national level unemployment dynamics, but also exhibiting at least some regional specifics (Western, Southern and Northern Croatia),
- regions under the specific regional influences (Eastern Croatia).

However, this interpretation of the results has several constraints. First of all, Central Croatia is by far the most developed region, and most of the economic activity is concentrated in that region. So, the strongest correlation with the national level developments does not really come as a surprise. When considering the recent war experience, one can also see that the Eastern Croatia was the region which was most strongly affected. Due to the fact, the overall reforms towards the market economy and consequently labour market reforms in Eastern Croatia were delayed in comparison to the rest of the country. However, the war cannot be the only issue, since other regions which were also more than averagely affected by the war (like Southern Croatia), exhibit stronger correlations with the national level dynamics. Due to its geographical differences, Croatian regions have developed specific economic structure. The Southern Croatia is the region mostly oriented to tourism, while the Eastern Croatia is predominately agricultural area. In the agricultural sector, there is a long-term tendency not to register as employed (and thus avoid taxes and social contributions). In tourism, there is a tendency not to register seasonal workers as employed. Up to the last quarter of 2002, the Croatian Employment Service had less strict regulations as to who can apply for the unemployment benefit, and a large number of persons used such a window of opportunity. Even though the users were entitled to the unemployment benefit for a limited period of time, the registration at the Employment Service, up to recently, meant that the person was entitled to other types of social insurance, specifically health insurance and other benefits in kind. The constantly decreasing number of registered unemployment ever since the Employment Service included the new measures confirms that at least part of the persons previously registered as unemployed were in fact employed, probably in the shadow economy. The extent to which the shadow economy differs across the Croatian regions might also affect the results of the applied regressions. There have been several studies on the shadow economy in Croatia, which have proved that it is strongly incorporated in the Croatian economy[9]. Although some of the conclusions could be drawn from the information about the structure of the shadow economy according to economic activities, there are no empirical data to support this implications for the regional distribution of the shadow economy. Even the above mentioned tendencies in tourism and agriculture should be considered as anecdotal evidence not properly supported by the official statistics.

Looking at the individual regressions in the SUR estimates, one can also notice that the regions which are geographically closer, have in general stronger influence on each other unemployment movements. However, there are also exemptions from that rule, which indicate that the relationship is under the influence of other factors, not examined in this paper.

4. Conclusions

The paper represents an attempt to investigate whether the regional unemployment in Croatia is mostly under the influence of the national labour market forces, or are there any region-specific characteristics. Since there is no unique tool which could provide a straight answer to the question, a number of econometric models were investigated. Even though the econometric models presented in the paper as well as the data used are not without impediments, they seem to confirm the overall belief that at least some of the regions do follow their own path, when it comes to labour market movements. This fact suggests that regional specific measures to fight unemployment should be considered in Croatian case.

The number of issues could have helped to such unemployment level dynamics. Some of them, like the shadow economy or the war effects, have already been mentioned before. However, there is also the question to which extent is the speed of transition and the introduction of the market-oriented reforms itself country-specific, and whether there are other region-specific forces that could speed or slower the transition. Judging from the anecdotal evidence, one can conclude that the restructuring of the Croatian economy does exhibit some regional specific movements. Adding to that the before analysed labour market indicators, as well as social differences stemming from historical and geographical factors, one must conclude that the room for further investigation positively exists.

Finally, we must also mention that the results presented above have no practical policy implications, and should not be treated as such. The level of aggregation used for the analytical purposes, i.e. NUTS II, is only a proposition of a new nomenclature for statistical purposes exclusively. Political decisions in Croatia are made, in addition to

national, only on county level, and there were no evidence of counties acting together in an attempt to reduce unemployment, particularly not aggregated as suggested by the analysis. The introduction of the decentralisation process in Croatian governance system is relatively recent – specifically, the implementation of the new decentralisation law started in the mid of 2001 - so the counties have not had time to design the specific measures to solve the unemployment issue on their territory. Hopefully, the type of analysis presented in the paper will help to articulate some of the labour market problems at the regional level in Croatia.

Acknowledgments

I am grateful to my colleagues Andrea Mervar and Sandra Švaljek, for very useful comments on a draft version of this paper. Any remaining errors and omissions are, naturally, my own responsibility.

Endnotes:

[1]. For the estimation of output loss due to the war, see Selowsky and Martin (1996). For more recent growth-related econometric analysis including Croatia, see Mervar (2002).

[2] More details on labour market developments during the 90s on the national level could be found in Crnković-Pozaić (1997) and Crnković-Pozaić and Starc (1998).

[3] Outline of the methods used, as well as the comparative results for the Australian data, can be seen in Shepherd and Dixon (2002).

[4] At the same time, the employment data on the county level published by the CBS does not adequately reveal the exact regional distribution, since the survey has been conducted based on the organisational principle, with more than a fair share of entities registered in the Central Croatia. Therefore, the higher unemployment rates in other region could stem from the fact that the unemployment data are adequately regionally distributed, while the employment data for the regions other than Central Croatia are probably underestimated.

[5] For instance, the demand for labour strongly increases during the summer months in the coastal part of Croatia. The reason being the tourist season which has a peak lasting 3 months a year, and therefore the demand for labour exhibits such a strong seasonal pattern. Other regions do not follow the same pattern.

[6] Erjavec, Cota and Bahovec (1999) also report the presence of the unit root in the national unemployment level series, based on data for the 1992:1 to 1998:12.

[7] Note that the critical values for the sample size 100 were reported from Engle and Granger (1987) and Engle and Yoo (1987), although the actual sample size is somewhat larger.

[8] A quote from Pesaran and Smith (1994), pg. 705, seems appropriate: "However, Theil's argument do not extend to models estimated by the instrumental variable (IV) method, even asymptotically… Nevertheless, R^2 is routinely reported as a measure of fit for IV regressions in the applied econometric literature."

[9] Since the problem of the shadow economy is not extensively investigated here, the reader will only be directed to the research conducted by the Central Bureau of Statistics, which can be found on their web-site www.dzs.hr, in Croatian only, under the headline "Procjena neslužbenog gospodarstva sustavom nacionanih računa".

References:

1. Crnković-Pozaić, Sanja and Nenad Starc, ed. (1998): "Human Development Report – Croatia 1998", UNDP, Zagreb.
2. Crnković-Pozaić, Sanja, ed. (1997): "Human Development Report - Croatia 1997", UNDP, Zagreb.
3. Engle, Robert F. and Byung Sam Yoo (1987): "Forecasting and Testing in Cointegration Systems", *Journal of Econometrics*, 35, pp. 143-159.
4. Engle, Robert F. and W. J. Granger (1987): "Cointegration and error correction: representation, estimation and testing", *Econometrica,* 55, pp. 251-276.
5. Erjavec, Nataša, Boris Cota and Vlasta Bahovec (1999): "Monetarno-kreditna i realna privredna aktivnost u Republici Hrvatskoj: VAR model", ("Monetary-credit and real economic activity in the Republic of Croatia: VAR model"), *Ekonomski pregled*, 50 (11), pp. 1488-1504.
6. Greene, William H. (2000): *Econometric Analysis*, 4th edition, Prentice-Hall, Inc.
7. Mervar, Andrea (2002): "Ekonomski rast i zemlje u tranziciji", *Privredna kretanja i ekonomska politika*, 92, pp. 53-88.
8. Pesaran, M. Hashem and Richard J. Smith (1994): "A Generalised R^2 Criterion for Regression Models Estimated by the Instrumental Variables Method", *Econometrica*, 62, May, pp. 705-710.
9. Selowsky, Marcelo and Ricardo Martin (1996): "Policy Performance and Output Growth in the Transition Economies", *American Economic Association (Papers and Proceedings)*, 87 (2), pp. 349-53.
10. Shepherd, David and Robert Dixon (2002) "The Relationship between Regional and National Unemployment", *Regional Studies*, 36 (5), pp. 469-480.