REGIONAL INCOME AND UNEMPLOYMENT DISPARITIES IN CROATIA

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1. INTRODUCTION

Knowing the extent and structure of regional disparities is highly relevant issue both from the point of theoretical considerations and from the point of policy designation. Existence of significant regional disparities is usually seen as key reason for devising special public policies aimed at reducing their level. Regional disparities in European Union and growing importance of Cohesion policy in last two decades has particularly drawn the attention of many researchers and resulted with huge literature about regional disparities on European level from various aspects. A number of studies have demonstrated that transition countries are particularly vulnerable to increasing regional disparities. Petrakos et al (2005a) investigated regional inequalities among new member states of European Union and found that significant levels of inequalities which are comparable to the ones in European Union. They also found that an increase in inequality has occurred in 1995-2000 period. Wostner (2005) provides evidence from Slovenia where disparities increased during 1990-1999 period in terms of economic activity measured by Gross Value Added, but remained stable according to personal incomes. Petrakos et al (2005c) investigate potential impact of size on regional inequalities among 10 European transition countries and find only weak evidence that larger countries tend to have relatively higher levels of inequality, but the differences between groups diminished over time.

Our goal is to assess dynamics of regional disparities in Croatia, whether they are increasing in a period when country is entering into more mature phase of development characterized by stable growth of its economy and intensive preparations for joining the EU. This is very important issue since Croatia entered the beginning of accession process in 2000 with already accentuated regional disparities. Regional disparities in Croatia have been so far analyzed in several studies. Nestić and Vecchi (2006) have analyzed regional poverty in 2002-2004 period and found out the existence of significant regional variation in poverty rate as well as increasing inequality in comparison to 1998, particularly within urban areas. Puljiz et al (2005) designed economic and demographic index, each comprising three socio-economic indicators and applied it to regional and local level. At county level, six units have been recognized as disadvantaged comprising 18% of total population. At local level, half of total number of units comprising one fourth of the total population were categorized as

disadvantaged. Cziraky et al (2003) combined structural equation econometric modelling with more descriptive cluster analysis techniques in order to obtain a development grouping of Croatian municipalities. Results suggested existence of four different clusters of local units according to different development characteristics. Pejnović (2003) used seven socio-economic and demographic indicators to analyze regional differences at NUTS 3 and higher regional level. The analysis acknowledged high positive correlation between population distribution and concentration of economic activities.

We approach to regional disparities both from the perspective of income and unemployment in order to obtain more complete picture on the structure and the extent of total regional inequality in Croatia. Our special attention will be paid to within-regional disparities. Although regional disparities are usually analyzed only from point of the regions, we should not forget that within-regional disparities represent also an important part of total regional disparities. Problems which might occur from ignoring within-regional levels have already been recognized by some authors (Lipshitz and Raveh, 1998; Soares et al 2003). Rest of the paper is organised as follows. In next chapter main features of regional development in Croatia are presented. Applied inequality measures and data sources are shortly explained in third chapter, while fourth chapter contains basic trends in unemployment and inequality disparities. Results of the regional inequality analysis are presented in fifth chapter, while conclusions are presented in last chapter.

2. REGIONAL DEVELOPMENT IN CROATIA

Territory of the Republic of Croatia is divided into county (regional) and local self-government units: 20 counties, the City of Zagreb and 550 municipalities. The City of Zagreb, as the capital of the Republic of Croatia is defined as a specific and unique territorial and self-government unit that has the status of both a town and a county. County units correspond to NUTS 3 level according to EUROSTAT methodology and represent basis for our analysis.[1]

With 56.542 sq. km of the surface area and 4.381.352 inhabitants or 78 in/sq km, Croatia is small country in terms of population and size. Despite its small size, it is quite diversified country with long history of pronounced regional disparities. While being part of ex-Yugoslavia, Croatia has been one of two most developed federal units, together with Slovenia. Still, internal differences were significant. Rapid post-war industrialisation in 1950-is and 60-is has resulted in massive out-migration from rural areas, formation of several strong urban centres and depopulated large rural areas. The consequence of such developments together with other important factors (e.g. transport isolation) was increase in regional differences. First categorisation of underdeveloped areas during 1960-is (1966-1970) included 19% of Croatia's area and 10% of total population. In the last period of categorisation (1981-1985) it covered 30,4% of total territory and 14% of total population (Bogunović, 1985).

Inherited regional differences have been further increased after 1990 due to the social and economic problems related to the process of transition and consequences of Serbian

[1] The current administrative division of the Republic of Croatia fulfils EUROSTAT's criteria regarding the statistical division on NUTS 0 and 1 levels (Republic of Croatia), NUTS 3 level (counties) and LAU 2 level (local self-government units), while negotiations about appropriate units for NUTS 2 level are still underway. NUTS 3 units represent the basis for our analysis, while LAU 2 units will also be included when calculating within-county disparities.

aggression and war during 1991-1995.[2] War devastations have particularly hit some areas that have already been marked as disadvantaged but have also expanded the list of disadvantaged areas to previously well developed parts of the country such as Vukovar-Srijem County in Eastern Slavonia along the border with Serbia.

Latest population census results show that first five counties in terms of population encompass half of the total population, while other sixteen cover the other half. In many counties population sharply decreased in comparison to 1991 (Lika-Senj County has lost around 35% of its 1991 population). Data on education level show that education level of first three counties is almost three times higher than the one in last three counties. Similar situation is with GDP per capita data. Another relevant feature of Croatia's regional development is strong metropolisation, which is also the case with many other European countries (Petrakos, 2005a). According to Central Bureau of Statistics (CBS) data, City of Zagreb accounts for 17,5% of total population, but also 31,5% of GDP and 38,5% of total number of persons with university degree.[3]

Figure 1: Map of Croatian counties[4]

[2] Direct cost of war in Croatia is estimated to two Croatian 1990 GDPs, whereas indirect cost in terms of lost development and investment cycles are deemed to be much higher (National Strategy for Regional Development, 2005).
[3] Values are calculated on the basis of Population Census and First Release on county GDP for 2001-2003.
[4] Names of the counties on the map are in Croatian, while later we shall use their english names.

Table 1: Basic development indicators of the counties

County	Population 2001	Area (km^2)	Population density	Population change 2001/1991	Share of highly educated popul. in popul above 15 yrs 2001[5]	GDP per capita 2003 € PPS (EU25=100)
Bjelovar-Bilogora	133.084	2640	50,4	93,4	6,6%	35,2%
Brod-Posavina	176.765	2029	87,1	102,6	6,9%	27,1%
Dubrovnik-Neretva	122.870	1785	68,8	98,6	14,0%	41,7%
City of Zagreb	779.145	641	1214,9	100,8	22,5%	84,5%
Istria	206.344	2835	72,8	101,4	12,3%	64,8%
Karlovac	141.787	3625	39,1	79,1	8,6%	36,6%
Koprivnica-Križevci	124.467	1735	71,7	97,0	7,0%	45,2%
Krapina-Zagorje	142.432	1229	115,9	96,4	5,8%	34,2%
Lika-Senj	53.677	5351	10,0	65,1	7,1%	48,7%
Medjimurje	118.426	729	162,4	101,0	6,5%	37,8%
Osijek-Baranja	330.506	4155	79,5	91,6	9,2%	35,5%
Požega-Slavonija	85.831	1823	47,1	87,5	6,7%	34,0%
Primorje-Gorski Kotar	305.505	3588	85,2	95,5	15,2%	55,7%
Sisak-Moslavina	185.387	4468	41,5	74,8	7,6%	36,3%
Split-Dalmatia	463.676	4542	102,1	98,5	13,5%	35,5%
Šibenik-Knin	113.304	2988	37,9	76,8	9,4%	32,8%
Varazdin	184.769	1261	146,5	98,8	8,4%	44,4%
Virovitica-Podravina	93.389	2024	46,1	90,8	5,7%	35,5%
Vukovar-Srijem	204.768	2454	83,4	90,3	6,7%	27,1%
Zadar	162.045	3625	44,7	76,8	10,6%	37,8%
Zagreb	309.696	3060	101,2	109,3	7,9%	35,0%
Croatia	4.437.873	56542	78,2	93,9	11,9%	47,2%

Source: Croatian Bureau of Statistics, results of the Population census 2001, County GDP 2001-2003 First Release; Eurostat

In following parts of the paper our attention will focus on the extent and dynamics of regional disparities in period 2000-2005 measured by personal income and unemployment indicators.

3. REGIONAL INEQUALITY MEASURES AND DATA

3.1 Inequality measures

Various measures can be employed in the analysis of regional inequality.[6] Our analysis will employ very common measures such as max/min ratio, coefficient of variation, Gini index and Theil index. Most simple measure is ratio of maximum and minimum value. The shortcoming of this indicator is that it is based only on extreme values and disregards values in the middle of the distribution. This problem is avoided when using population weighted coefficient of variation or σ (sigma) convergence coefficient whose value is determined on the basis of all observations. Coefficient of variation is estimated from the formula:

[5] Includes population with non-university college degree and university degree.

[6] For more detailed review of regional inequality measures see B. Portnov i D. Felsenstein: «Measures of Regional Inequality in Small Countries» in „*Regional Disparities in Small Countries*“, Springer, Berlin, 2005.

$$CV_W = \frac{1}{\bar{y}}\sqrt{\left[\sum_{i=1}^{n}(y_i - \bar{y})^2 \frac{P_i}{P_{tot}}\right]}$$

where

$y_i =$ variable under examination in region i

$\bar{y} =$ national average of the variable under examination

$P_i =$ population in region i

$P_{tot} =$ national population

$n =$ number of regions

Gini coefficient is probably the most popular summary inequality measure, used vastly in individual-level income studies, but also for purposes of regional inequality analysis. Following formula calculates Gini for individual data:

$$G = \frac{1}{2n^2\bar{y}}\sum_{i=1}^{n}\sum_{j=1}^{n}\left|y_i - y_j\right|$$

Because the data under consideration here is grouped and, moreover, the partition is not equal, the following formula will be used for calculating the Gini for grouped data[7]:

$$G = 1 - \sum_{i=1}^{n} f_t\left(q_t + q_{t-1}\right)$$

where q_t is the sum of the shares of income received by groups that have an income less than or equal to x_t, and f_t is the fraction of population in group (x_{t-1}, x_t). However, it should be noted that this formula gives an estimate of inequality only between the income groups, and ignores the inequality within the income groups.

Another popular inequality measure that will be applied here is Theil index which belongs to generalized entropy class of inequality measures. The measures in this class are given to the following generic formula:

$$I_\alpha = \frac{1}{\alpha^2 - \alpha}\left[\frac{1}{n}\sum_{i=1}^{n}\left[\frac{y_i}{\bar{y}}\right]^\alpha - 1\right]$$

The parameter α represents the weight given to distances between incomes at different parts of the income distribution, and can take any real value. Most common values of α used are 0,1 and 2 (World Bank, 1999). Theil index T for individual data and α=1 is equal to:

[7] Note that this formula assumes equal incomes within each subgroup (in this case: city), and therefore disregards inequality within the subgroups, thus systematically underestimating total inequality.

$$T = \frac{1}{n}\sum_{i=1}^{n}\frac{y_i}{\overline{y}}\ln\left(\frac{y_i}{\overline{y}}\right)$$

Since we deal with grouped data, we use following Theil index:

$$T = \sum_{i=1}^{n} w_i \ln\frac{w_i}{p_i},$$

where w_i is the group share of the variable under examination, p_i is the group population, employed population or workforce share, depending on the variable. Theil index compares the relative income (unemployment) share of each group with its relative share in the total population or total employed population (workforce) depending on the variable.

A very special and useful property of Theil index is its decomposability into subgroups. In other words, it enables us to calculate, in addition to between group (region) inequality, a within group inequality, which is not the case with Gini coefficient. In our case it means that we can calculate total regional inequality as a sum of between-county inequality and within-county inequality. The formula for this decomposition is:

$$T = T_B + T_W = \left[\sum_{i=1}^{n} w_i \ln\left(\frac{w_i}{p_i}\right)\right] + \left[\sum_{i=1}^{n} w_i T_i\right]$$

where w_i is the county share of the variable under examination, p_i is the county population or workforce share, depending on the variable and T_i is Theil-index for inequality within county i, which is given by:

$$T_i = \sum_{j=1}^{m}\left[w_m \ln\left(w_m / p_m\right)\right]$$

where w_m is the municipal share of the variable under examination, p_m is the municipal population, employed population or workforce share, depending on the variable and m is the number of municipalities situated in county i.

It is important to notice that both Gini and Theil index satisfy all distributional axioms important for selection of inequality measure such as:
- anonymity (no personal characteristics other than the income determine the ordering principle),
- scale independence or income homogeneity (multiplying all incomes with the same positive scalar does not change inequality),
- population independence or population homogeneity (replicating each income an integral number of times does not change inequality),
- the transfer principle or Pigou-Dalton condition (transfers from a richer to a poorer person do reduce the measured inequality) (Cowell, 2000).

Gini and Theil index will take values between zero (perfect equality) and one (perfect inequality). Since both indicators satisfy the distributional axioms described above, their results should not differ with regard to the ordering alternative distributions from the same data set. They differ, however, in the weight they attach to a specific income in this

distribution, and therefore in their cardinal measurement of inequality.[8] For the Theil index, sensitivity for transfers in different income classes is defined by the parameter α; lower value of α implies a relative overweighting of lower income groups. The sensitivity of the Gini coefficient depends critically not on the size of the income levels but on the rank order position of the person in the ranking by income levels (Sen, 1973). Therefore, if more people are in the lower end of the income distribution, as is usually the case, these lower incomes will get a stronger weight.

3.2 Data

Our database includes personal income, employment and unemployment data collected for all regional (county) and local (municipal) units in period 2000-2005. Income data include data on total wages and pensions. Furthermore, data on wages include wages before and after taxation. GDP data, representing usual data for analysis of regional income disparities, are here used only partially due to the problem of availability.[9] Data are collected from two sources. One is Croatian Employment Service (CES), which provided monthly data on unemployed persons for the period of analysis and second one is Croatian Tax Office, which provided data incomes and number of employed persons at local and regional level, collected from personal tax applications. In this case, data from Tax Office have some important advantages when compared to official statistical source, the Croatian Bureau of Statistics (CBS). First and most important, data from Tax Office are collected already at the local level, while CBS data are available only at regional and national level. Another problem with CBS data is that employment data are not collected on residence principle, but according to the seat of employer, which significantly reduces reliability of the data in cases where place of residence differs from working place at local and/or regional level. Finally, former source is based on a register covering all employed population, while the latter one collects data from a survey and is thus less reliable source.

4. INCOME AND UNEMPLOYMENT REGIONAL DISPARITIES

4.1 Comparison of Croatia and EU member states

Income per capita and unemployment rate are probably the most prominent indicators used in the analysis of regional disparities. This is not surprising taking into account that income per capita is standard indicator of achieved development level, and unemployment rate is key indicator for measuring structural difficulties of the economy. Analysis which takes into account both indicators should provide more complete picture about regional disparities. Before focusing attention solely of Croatia's internal disparities we compare the extent of regional disparities in Croatia with other European states. Since Petrakos et al (2005a,b) already performed comparative analysis of regional inequalities in member states and accession countries for 2000 on the basis of GDP per capita data, we shall use their results and add data for Croatia[10]. Table 1 presents values for observed countries according to max/min ratio and weighted coefficient of variations. Comparison reveals that Croatia can be assessed as country with medium regional inequalities in comparison with EU member countries. Countries with highest regional inequalities are Latvia, Poland and Estonia, while

[8] Inequality measures are called cardinal equivalent if one scale can be obtained from the other multiplying by a positive constant and adding or subtracting another constant (Cowell, 2000)

[9] GDP data at county level are at the moment available only for 2001-2003 period.

[10] Petrakos et al (2005) used also other years before 2000 to analyze dynamics of inequalities, but due to unavailability of data, we can not include Croatia in comparison.

least differences are in Spain, Sweden and Slovenia. It is important to note that level of regional inequalities of transition countries is comparable (or even higher) with level of the EU-15 countries, meaning that new member states have in short period of 10 years reached levels of regional inequalities comparable to those in old member states (Petrakos, 2005a). Croatia also fits into this conclusion as its level of regional inequality is comparable or higher than in Austria, Finland, Denmark, Ireland and Greece, for example (which can be labelled as small countries). We also carry out comparison according to unemployment rate, but with smaller number of countries, due to problems with availability and reliability of data from EUROSTAT at NUTS 3 level. Figure 1 ranks selected EU countries and Croatia according to difference between maximum and minimum rate in 2004. Results are this time different for Croatia as its regional disparities are looking more similar to countries with highest unemployment disparities, such as Greece, Italy, Poland, Slovakia and Spain. On the other side, Ireland, Sweden, Slovenia and Denmark have the lowest regional disparities. It is also interesting to see that for some countries unemployment disparities in some countries are considerably different than income disparities. This is a case with Hungary, whose regional disparities in unemployment are much smaller than in incomes. Opposite example represents Spain with high unemployment and small income regional disparities. Finally, both comparisons in terms of GDP and unemployment confirm that regional inequalities in small countries can be significant just in case of the big countries.

Table 2: Comparison of regional inequalities on GDP per capita in 2000 at NUTS 3 level in the EU member states and Croatia[11]

Country	**Max/Min ratio**	**Weighted coefficient of variation (CV_w)**	**Ranking according to CV_w**
Latvia	4,3	0,74	1
Hungary	3,6	0,58	2
Estonia	2,7	0,56	3
U.K.	7,6	0,54	4
Poland	5,2	0,53	5
Belgium	4,8	0,53	6
France	5,9	0,52	7
Portugal	3,6	0,52	8
Germany	6,8	0,50	9
Romania	4,3	0,48	10
Czech Republic	2,8	0,45	11
Slovakia	3,5	0,41	12
Croatia	3,0	0,39	13
Bulgaria	2,6	0,39	14
Austria	2,5	0,36	15

[11] In case of Croatia 2001 data have been applied since this is the closest available year for comparison. Luxembourg, Malta and Cyprus are left out due to their small size and lack of data at the regional level

Finland	2,2	0,32	16
Italy	2,9	0,31	17
Lithuania	2,4	0,31	18
Denmark	2,3	0,29	19
Ireland	1,9	0,29	20
Greece	3,2	0,27	21
Netherlands	2,6	0,26	22
Spain	2,3	0,25	23
Sweden	1,8	0,25	24
Slovenia	1,8	0,24	25

Source: Petrakos et al (2005), own calculation on the basis of CBS data

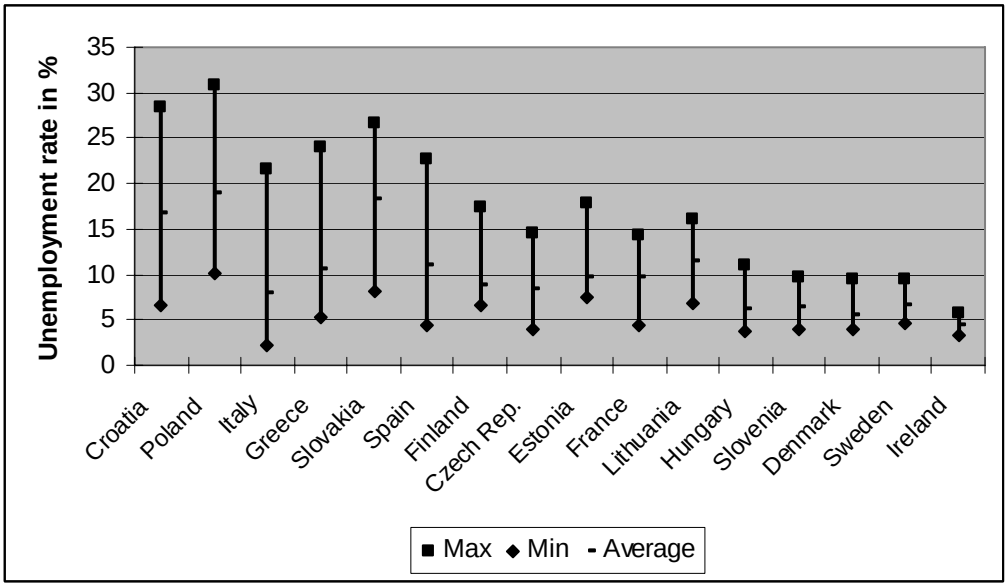

Figure 2: Max and min unemployment rate at NUTS 3 level in 2004

Source: Eurostat, calculation of the author on the basis of Croatian Employment Service and Ministry of Finance data

4.2 Basic trends in regional incomes and unemployment rate in Croatia

Three different income indicators are used in the following analysis. First one represents aggregate wages (after taxation) and pensions per capita, second is wage before taxation per capita, and third is wage before taxation per employee. The first indicator can be considered as approximation of disposable income per capita and will be shortly labelled as income per capita[12]. The second indicator provides more accurate approximation of economic strength of the unit as it excludes pensions and effect of taxes, depending solely on the level of wages and employment rate.[13] It will be labelled as gross wage per capita. Third indicator represents

[12] Taking into account that these two types of incomes represent majority share of total personal income, they are considered as representative approximation of disposable personal income (Nestić, 2002).

[13] Tax reliefs for some areas, such as Areas of Special State concern and Hilly, Mountainous Areas and units on islands distort true picture of economic strength of the county units encompassing such areas. As the number of

average gross wage and it will be labelled gross wage per employee. Analysis will start by presenting various graphs on regional disparities, as they enable us to easily track position of each county within the total distribution. Later we shall turn to summarized information on disparities by using inequality measures.

Recovery of Croatian economy after short crisis in 1999 has been reflected both by income level and unemployment rates. At national level all three types of income have increased during 2000-2005 period. Highest growth recorded incomes per capita (wages and pensions) with total increase of 48,3%, wages before taxation per capita increased 45,2%, while wages per employee increased 27,3%. Most obvious reason for differences in growth rates between average wage and other two incomes is due to changes (increase) in employment. Such conclusions are in line with changes in unemployment rate which fell from 20,8% to 16,6%. Incomes had enjoyed relatively stable and continues growth, while unemployment rate after reaching its peak, 21,3% in 2001 fell sharply in 2003 and continued falling with somewhat slower rate[14].

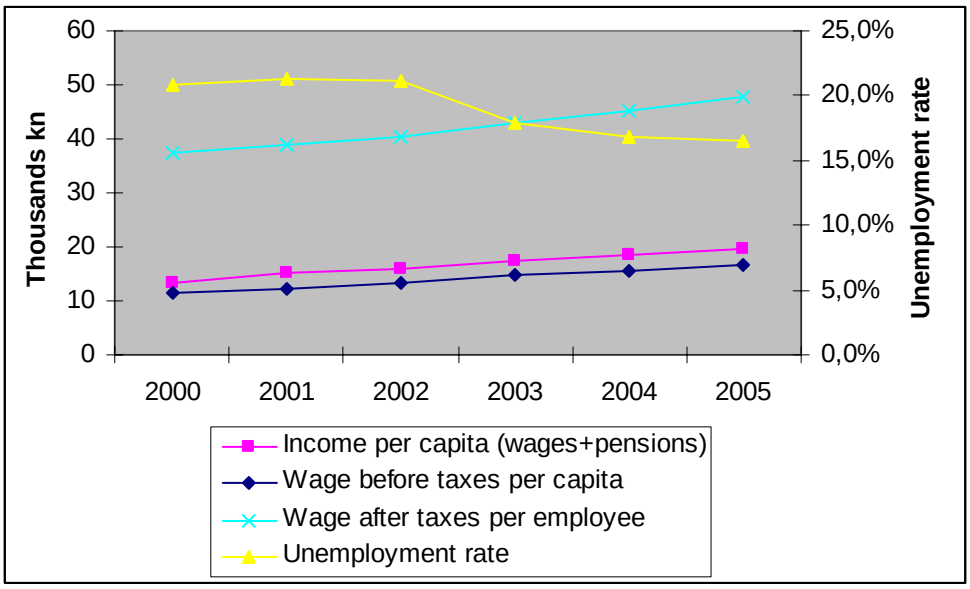

Figure 3: Incomes and unemployment at national level in Croatia

Figure 4 illustrates that per capita income has continuously increased in all counties, but they also clearly suggest that convergence has not occurred. Furthermore, figures show existence of significant differences in income levels. Counties can be broadly divided into three groups according to the income level: first one comprising city of Zagreb, second one with Primorje-Gorski Kotar and Istria County and third one comprising rest of the counties considerably lagging behind first two groups.[15] First three ranked counties were the only ones with above average incomes in 2000 (County of Zagreb joined them in 2005). Biggest changes happened inside last group of counties as their distribution is much more dispersed at the end than at the beginning of the period. It should be noted that five counties with lowest income are all

local units enjoying this privileged status is quite high (around 50% of total units) it is important to exclude taxes from the calculation.

[14] It should be noted that reduction of unemployed persons in 2003 was under the influence of change in methodology and more strict criteria used for registering unemployed status.

[15] When comparing position of city of Zagreb with position of other counties it should be taken into account that former represents biggest urban agglomeration in Croatia, while all other units are combination of urban and rural areas.

situated in eastern part of the country (Slavonia), suggesting the existence of geographically large disadvantaged area which surpasses county boundaries. In next step we shall consider relative positions of the counties according to different income concepts. Continuous growth happened to all counties in case of two other indicators, gross wage per capita and gross wage per employee, so we shall proceed with analysis of changes of relative positions.

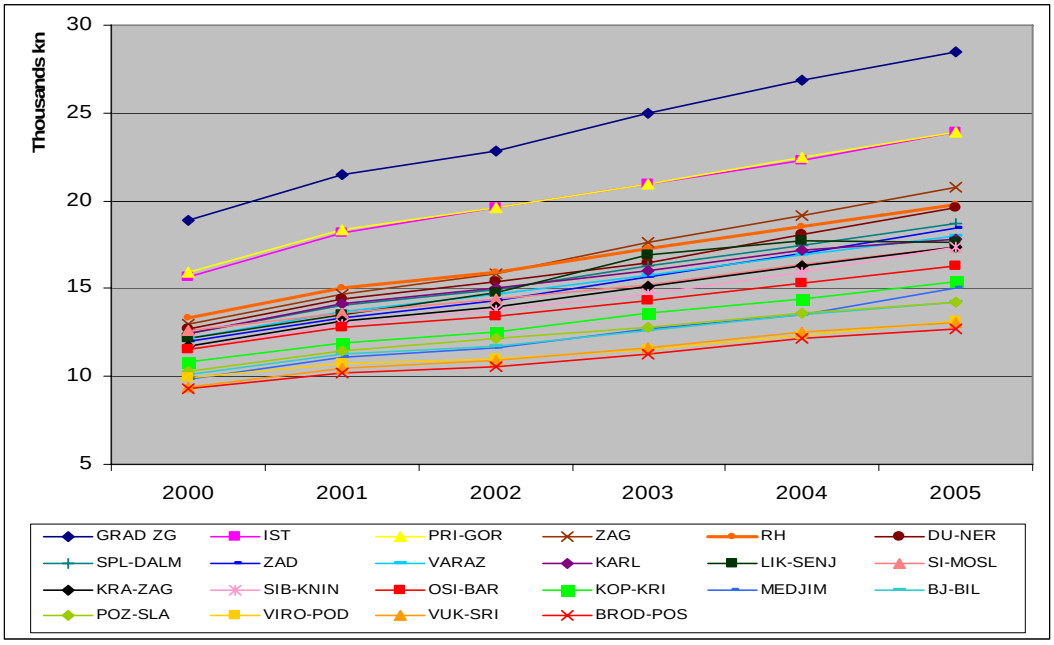

Figure 4: Incomes per capita at county level in period 2000-2005

Changes in relative positions according to income per capita are shown in Figure 5. In general, position of the counties in the observed period has been relatively stable. Changes mostly occurred at the lower part of distribution. Four counties with below average values deteriorated their positions for more than five percent, while only County of Zagreb improved its position for more than five percent. Such developments suggest that regional differences are increasing. Development of wages before taxation per capita is very similar to incomes per capita, meaning that pensions do not have any substantial impact on regional disparities.[16] Relative positions of counties are in general very stable except for the few counties in the lower part of the distribution and two individual cases in middle and upper part. Best results recorded County of Zagreb (nine percents increase with respect to national average), while County of Virovitica-Podravina was the biggest "loser" (minus eleven percents). It is interesting to note that biggest changes in relative positions of the counties occurred by indicator with lowest regional differences; in this case that is gross wage per employee. Many counties have considerably worsened their position while only few have slightly improved it. This time "losers" can also be found in the middle part of the distribution, while the only considerable advance can be noticed in case of city of Zagreb. Considering distribution of counties according to all three income indicators, results confirmed sharp division between city of Zagreb and rest of the counties. City of Zagreb further strengthened its superior position, followed by Istria, Primorje-Gorski Kotar and Zagreb County with above average values. All other counties still face below average or at best, average values.

[16] The only exception is Lika-Senj county whose ranking according to gross wage per capita is much lower than according to incomes per capita. Reason for the difference lies in the above average pensions per capita in this county.

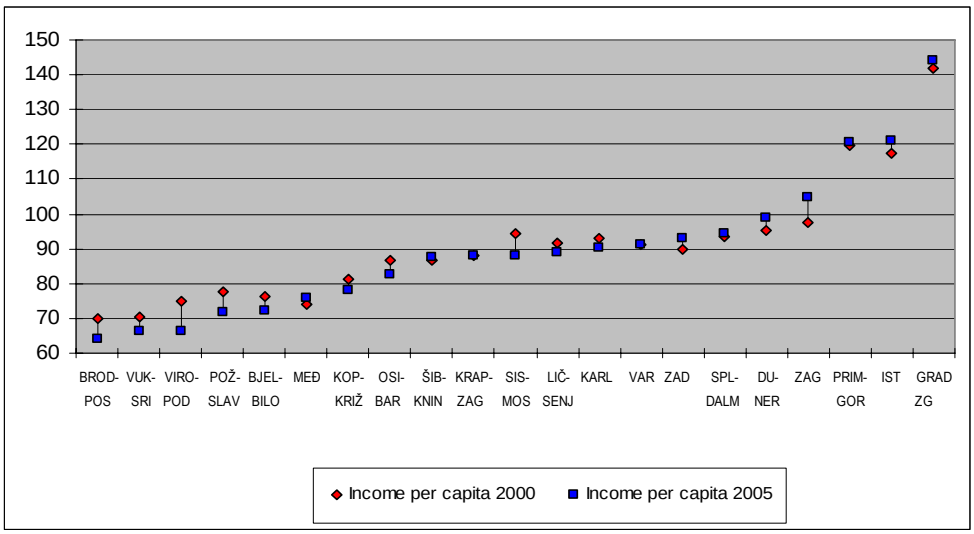

Figure 5: Relative changes in income per capita (Croatia=100)

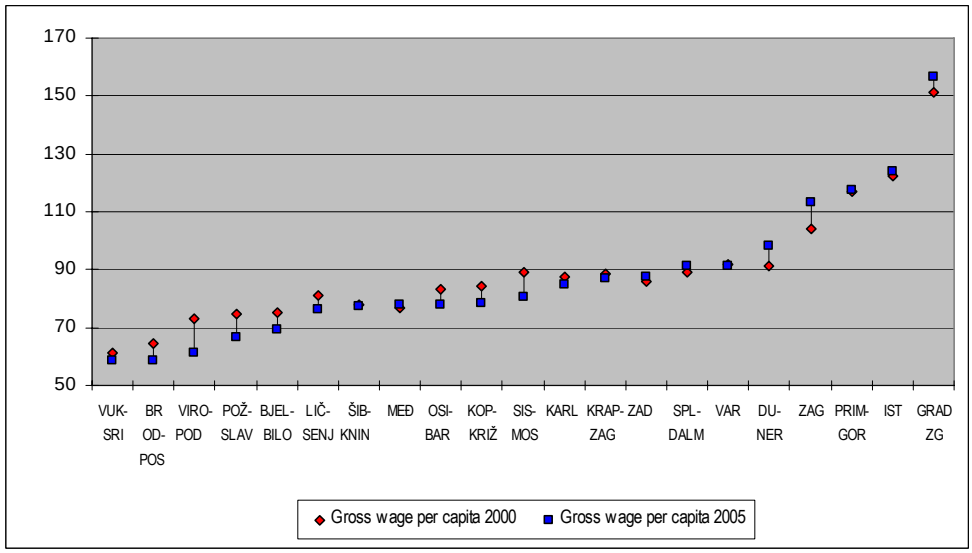

Figure 6: Relative changes in gross wage per capita (Croatia=100)

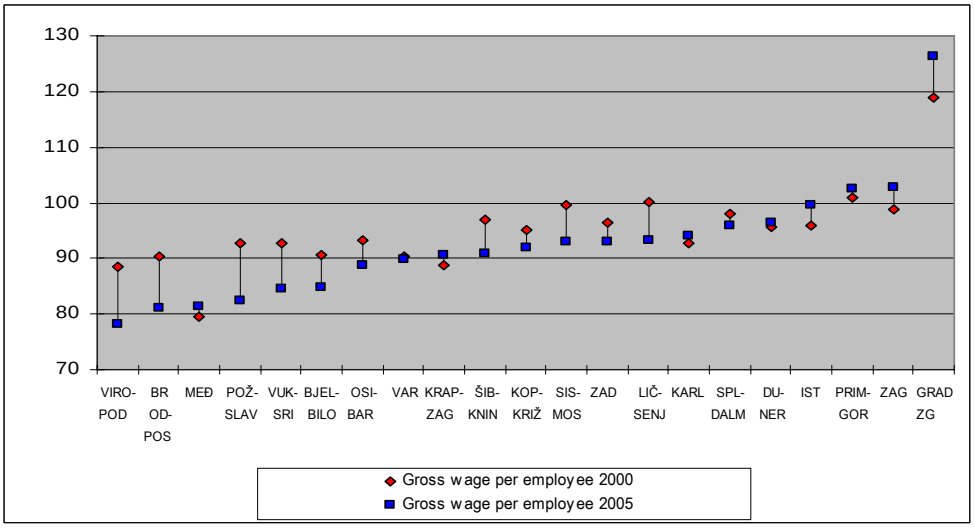

Figure 7: Relative changes in gross wage per employee (Croatia=100)

In case of unemployment, majority of counties followed changes in national unemployment rates. Fall in unemployment has been recorded in all but two counties, where stagnation occurred. Most significant drop of unemployment rates occurred in coastal counties like Šibenik-Knin, Zadar, Dubrovnik and Split-Dalmatia County, most probably due to strong development of tourism. Most of these counties had high initial unemployment rates, particularly Šibenik-Knin County whose unemployment rate in 2000 was over 30%. Counties with lowest initial unemployment rate also significantly reduced unemployment rate which makes bringing conclusions about change of disparities at this point difficult. Better evidence on dynamics of regional disparities provides change in relative positions of the counties.

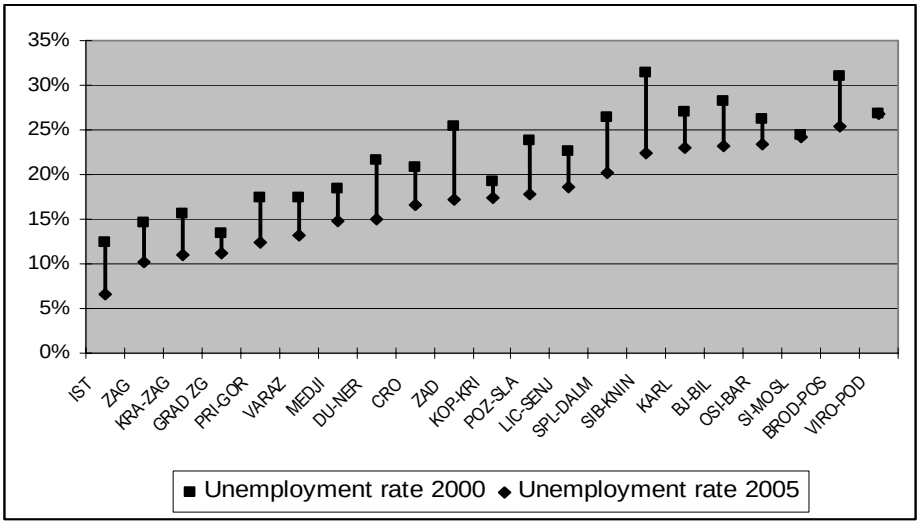

Figure 8: Changes in regional unemployment rates

Figure 9 indicates that large majority of counties experienced only minor changes in their relative positions. Still, few counties experienced significant changes. Most notable changes happened to Virovitica-Podravina and Sisak-Moslavina County with stagnating unemployment rate, whose relative position significantly worsened. On the other side County of Istria further strengthened its leading position. Previously mentioned coastal counties in the middle and southern Adriatic also improved significantly their positions with the exception of Split-Dalmatia County which achieved only minor improvement. Such developments suggest that an increase in regional disparities has taken place.

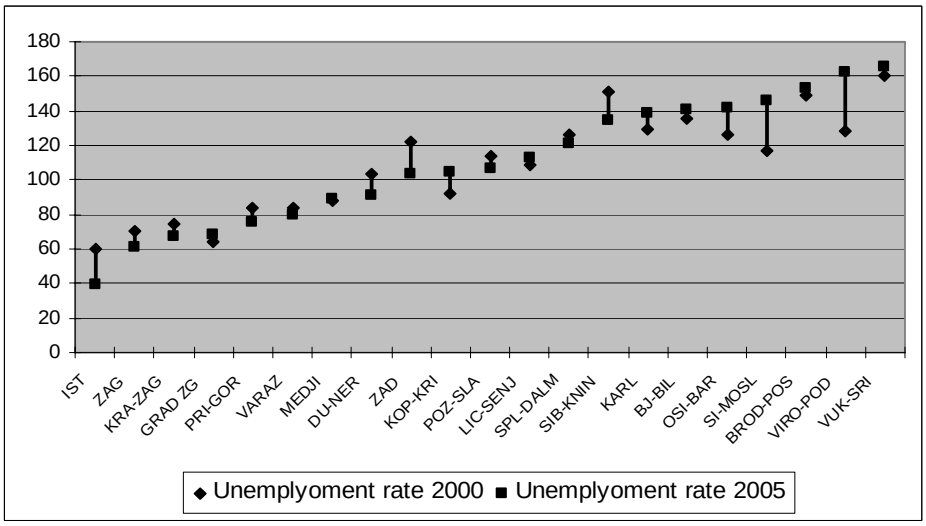

Figure 9: Relative changes in regional unemployment rates (Croatia=100)

4.3 Calculation of regional income and unemployment inequalities

Previous results suggest that an increase in regional income disparities occurred. Still, with support of quantitative results from various inequality measures, we can gain better feeling about the extent and dynamics of disparities. Table 3 summarizes the results of inequality measures. Most pronounced inequality has been recorded in terms of unemployment rate, both at the beginning and at the end of the period. In case of income indicators, highest disparities are noted according to gross wage per capita and least ones according to average wage. Significant difference in disparities between gross average wage and gross wage per capita mean that differences in employment level had substantial impact on disparities according to gross wage per capita (and incomes per capita). Smaller differences in income per capita with respect to gross wage per capita are due to impact of pensions which obviously act as an equalisation factor concerning regional inequalities. It should be noted that an increase in regional inequality took place according to all indicators. The highest increase occurred in terms of unemployment rate and the average wage, and a least one according to incomes per capita. If we compare values of coefficient of variation for wage per capita with regional GDP variations it is clear that personal income variations are smaller than the GDP ones. Logical explanation for the difference in variations is different sectoral composition of employment, as some counties have higher share of employment in public sector where average wages are higher than in the private sector. Still, this is only a speculation that should be properly investigated.

Table 3: Dynamics of regional inequalities

	Income pc 2000	**Income pc 2005**	**Gross wage pc 2000**	**Gross Wage pc 2005**	**Gross wage per employee 2000**	**Gross wage per employee 2005**	**Unemployment rate 2000**	**Unemployment rate 2005**
Max/Min	2,0	2,2	2,5	2,7	1,6	1,8	2,7	4,2
Weighted coefficient of variation	0,23	0,25	0,28	0,31	0,14	0,18	0,31	0,36
Gini coefficient	0,124	0,140	0,150	0,170	0,068	0,091	0,175	0,205
Theil index	0,057	0,058	0,077	0,083	0,017	0,023	0,085	0,107

Source: Author's own calculations

In next step, we turn to calculation of within-county inequalities. As already explained earlier Theil index has very useful property of perfect decomposition of total inequality into inequality within and between groups. In our case, it means that we can express total inequality as sum of between county inequality and within county inequality. Data from table 1 acknowledge that counties are rather small units in terms of size and population units and therefore one could expect that within-county inequality are very small ones. Still, results from table 4 tell different. Within-county inequalities turned out to be quite significant, most notably in case of incomes and gross wages per capita where they accounted about half of the total inequality in 2000. On the other hand, within-county contribution has fallen within all indicators meaning that overall inequality is becoming more driven by between county than within-county differences. In case of incomes per capita and gross wages per capita, a fall has occurred due to decrease of within-county inequality, while in the case of average wage it was due to lesser increase than in the case of between county contribution.

Table 4: Dynamics of between-county and within-county inequalities

	Income pc 2000	**Income pc 2005**	**Gross wage pc 2000**	**Gross Wage pc 2005**	**Gross wage per employee 2000**	**Gross wage per employee 2005**	**Unemployment rate 2000**	**Unemployment rate 2005**
Theil index	0,057	0,058	0,077	0,083	0,017	0,023	0,085	0,107
Between-county contribution	0,025	0,031	0,037	0,047	0,010	0,015	0,048	0,067
Within-county contribution	0,031	0,027	0,040	0,036	0,007	0,008	0,037	0,041
Share of within-county contribution	55%	47%	52%	43%	40%	35%	43%	38%

Source: Author's own calculations

Now that the relevance of within-county inequalities has been confirmed we are looking which counties have highest internal disparities, i.e. which are the most heterogeneous ones and also how do different within-county inequalities correlate.

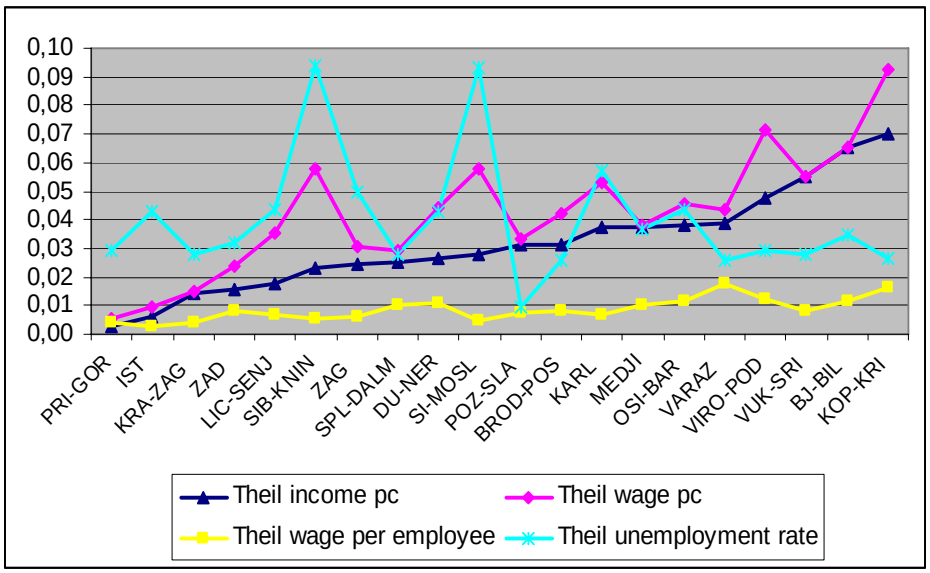

Figure 10: Within-county Theil index for various indicators in 2005

Figure 10 reveals that there exist significant differences between counties in terms of within-county disparities, but also according to indicators. Primorje-Gorski Kotar, Istria and Krapina-Zagorje County are three most homogenous counties in terms of income distribution, while Vukovar-Srijem, Bjelovar-Bilogora and Koprivnica-Križevci County are most heterogeneous ones. In terms of unemployment, highest internal disparities are in Šibenik-Knin and Sisak-Moslavina County (they could be considered as outliers), while Pozega-Slavonija is by far the most homogenous county. Results also indicate that distributions of Theil index values for income indicators and for unemployment rate have very weak correlation, while income

indicators are expectedly highly positively correlated.[17] For example, Šibenik-Knin County is faced with quite low within-county inequalities in terms of average wage and incomes per capita, and medium-level inequality in terms of wage per capita. On the other side, its unemployment inequality is the highest in Croatia. The opposite example represents Koprivnica-Križevci County with exceptionally high income per capita and wage per capita inequalities, but relatively low unemployment and wage per employee inequalities. In terms of within-county variations according to various indicators, it should be pointed that range of disparities is much smaller in case of wage per employee than for other three indicators.

Another aspect always interesting to investigate is impact of taxes on regional inequality. This is particularly important in case of Croatia as fiscal policy measures are one of key regional policy instruments at the moment. In this case available data enabled us to compare inequality according to average wage before taxation and after taxation.[18] Results are shown in table 5.

Table 5: Pre-tax and after-tax regional inequality

	Gross wage per employee 2000	**Gross wage per employee 2005**	**Wage after taxation per employee 2000**	**Wage after taxation per employee 2005**
Weighted coefficient of variation	0,14	0,18	0,10	0,14
Gini coefficient	0,068	0,091	0,055	0,079
Theil index	0,017	0,023	0,010	0,016

Source: Author's own calculations

Results indicate that income taxes had positive impact on reduction of regional disparities. Values of all inequality measures are considerably lower in case of disposable wages both in 2000 and 2005. Nevertheless, income tax did not prevent inequality to rise despite a major increase in number of local units enjoying favoured tax regime occurred during in 2002.[19]

5. CONCLUSIONS

We apply various inequality measures such as coefficient of variations, Gini coefficient and Theil index to regional (county) and local units to assess the extent and dynamics of regional income and unemployment disparities in the period 2000-2005 in Croatia. We measure income inequalities on the basis of various types of personal income. After analyzing inequalities at regional level, Theil index is used to evaluate within-regional inequalities. Finally, we were able to evaluate impact of income tax on income inequalities. Our main finding is that Croatia is faced with moderate regional income (in terms of personal income) and significant unemployment disparities. Policy makers should paid particular attention to

[17] Correlation analysis was omitted due to space, but results indicated very weak correlation between unemployment disparities and income disparities for all three types of income. The only significant correlation at 10 percent was noted in case of unemployment and wage per capita disparities and it was negative (-0,35). Correlation coefficients in case of income disparities are all high and positive.

[18] Both income tax and surtax, which is a local tax, are included. Available data did not allow to separate these two taxes and to evaluate only impact of income tax. Still, the surtax should have only minor changes on results as it is calculated on the basis of the value of income tax and its highest rate is 18%).

[19] During 2002 number of local units covered by various «regional» Laws and enjoying various personal income tax reliefs has been considerably expanded. Total number of inhabitants enjoying tax reliefs has been increased for around 409 thousands or 9,2% of total population.

the dynamics of disparities as results have shown that there has been a considerable increase in income and unemployment disparities during observed period. Interesting aspect of inequality analysis has been its decomposition on between-regions and within-regions component. Within-region inequality turned out to represent a quite significant share of total regional inequality for all income and unemployment indicators. Still, its relevance is decreasing over time meaning that total inequality is becoming more driven by between-regions inequality than by within-region inequality. There exist significant differences among the counties according to within-county inequalities. While some counties are quite homogenous, others are faced with high internal disparities. Results also demonstrated very weak correlation between income and unemployment within-region inequalities. Results have proved that taxes play role in reducing regional income inequalities in Croatia, but that they were unable to prevent inequalities to rise despite intensified government's support through various fiscal measures for disadvantages units. From the geographic point of view we can form several groups of counties according to income and unemployment levels. City of Zagreb represents a special case with respect to income indicators due to its high income values. In terms of unemployment Zagreb does not demonstrate such superiority, but is nevertheless positioned among the most successful counties. Istria, Primorje-Gorski Kotar and Zagreb County form second group of counties with above average incomes and low unemployment rates. County of Zagreb had remarkable growth in income levels, while in case of County of Istria a considerable decrease in unemployment has occurred despite the fact that it already enjoyed lowest unemployment. Third group includes all other counties, whose relative positions in unemployment and especially income are still far from first two groups. Nevertheless, it should be noted that some counties in third group such as Zadar and Sibenik-Knin County had excellent results in reducing unemployment levels. Most lagging counties whose relative position has further worsened in the observed period both in income levels and unemployment are situated in eastern part of the country. Comparison with EU member states according to GDP per capita data showed that Croatia belongs to group of countries with moderate income, but significant unemployment regional disparities. Once again, it is acknowledged that unemployment currently represents most significant regional development problem and that policy makers will have to increase efforts in order to make any substantial impact on reduction of regional unemployment disparities.

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