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Long Term Changes in Croatia's Wage Inequality: 1970-2006

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The wiiw Balkan Observatory

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LONG TERM CHANGES IN CROATIA'S WAGE INEQUALITY: 1970-2006

1. INTRODUCTION

It is often said that looking at economic inequality is like 'watching the grass grow'. With the exception of some rare dramatic event, changes in economic inequality generally take place slowly so long periods are required to recognize any changes. This paper attempts to look at changes that a multitude of such rare dramatic events and less dramatic events had on inequality of wage distribution (wage inequality) and on changes in the dispersion of relative wages (wage dispersion) over a span of 36 years in Croatia, starting from 1970 and ending in 2006.

The analyzed period was marked by extensive institutional uncertainty and change, external shocks, macroeconomic instability and stabilization policies often including incomes policies, while the economy was transformed into an upper middle income economy. Certainly there was more than one dramatic event. It therefore seems justified to expect these changes could have influenced changes in both wage dispersion and wage inequality. The analyzed 36-year period was chosen for reasons of data availability of the two data sets we use. It does not include any 'natural' first or 'last' year. From 1970 onwards data was collected for wages for different levels of educational attainment according to a new methodology that has not changed since and in March 1973 for the first time data was collected for fully employed workers according to their net wage. Both data series were collected and published by the Croatian Central Bureau of Statistics and have been published regularly since then with the latest available data for 2006.

In the paper we analyze the levels and changes in wage dispersion according to these two data sets for the 36 year period (using the data for the average wage for different levels of educational attainment) and wage inequality (by supplementing the mentioned data set with the distribution of fully employed workers by their net wage). The inequality levels are calculated by applying the two most often used inequality measures, namely the Gini coefficient and the Theil index.

This paper develops the above argument in the following five sections. The following (second) section provides a general background to institutional, policy and macroeconomic developments during the 36-year period and shows that the whole period was one of extreme instability with no individual sub-period lasting more than a decade (except possibly the current one that started in 2000). The next (third) section discusses in detail the data used in the paper to measure the long term trends. This is followed by a brief (fourth) section describing the inequality measurements used, i.e. Gini coefficient and Theil index, and the formulas used in the calculation. The penultimate (fifth) section gives the results of the measurement and a brief discussion of their possible implications. The final (sixth) section offers some concluding remarks and the data is provided in two appendixes.

2. THE SETTING: INSTITUTIONAL AND POLICY FRAMEWORK

It seems reasonable to assume that changes in wage inequality and wage differentials are tied to macroeconomic developments, microeconomic constraints, demographic trends and institutional changes. To better understand and explain the changes in wage inequality and wage differentials during the chosen period a brief survey of the relevant institutional framework for labour allocation and wage policies may prove helpful.

Understandably, during the 36-year period there was a great deal of institutional restructuring which had far-reaching consequences for labour allocation and wage determination. The developments included multiple institutional changes and the implementation of varied policy options. The former ranged from a complete regime change to minor reforms. The latter ranged from complete liberalization to wage freezes. In addition the period was one of extensive macroeconomic instability. In this sense, there was a continuous high level of institutional and policy instability and uncertainty during the period. Each of these changes should have had an influence on labour allocation and wage policies. For a more detailed survey of the first, Yugoslav period, from 1970 to 1990 see Sirotković et al (1985), Drakul (1984), Prica (1991), Korošić (1988) and data provided in Savezni Zavod za Statistiku (1989). More detailed surveys of the second, independent, period from 1991 to 2006 can be found in Družić (2003) Bićanić and Franičević (2004) and for the data see Statistički Ljetopis Hrvatske (2008). For a political economy interpretation of the first period see Mencinger (2000), Jerovšek et al (1986) and Horvat (1985) and for the second period Bićanić and Franičević (2003) Čičin Šain and Šonje (2007) and Bićanić (2007). Of course, the literature on both periods and both topics is voluminous so the above is a selection the authors found useful in the survey.

Concerning institutional and policy instability almost all possible causes of instability were present during the period, many of them more than once. Thus during the period, there was:

- Military conflict. The Homeland War lasted from 1991 to 1995.
- Regime change. There was a major regime change that started in 1989 referred to as the transformation through which socialism was dismantled and replaced by capitalism.
- Contraction of market arbitrage. There was a contraction of the internal market when Croatia, gaining independence, moved from a medium sized internal market of 23 million inhabitants and an estimated social product of 2.203 billion dinars in 1986 (the pre-1990 maximum) to one of only 4.5 million and 546 billion dinars.
- Economic Reforms. There were three major reforms, two during the socialist period in 1972 and in 1983 and one in capitalism starting in 2000 and a multitude of smaller ones during the socialist period. The 2002 reform that introduced substantial liberalization in labour markets is especially important.
- Anti-inflationary policies. The macroeconomic instability led to almost a continuum of short-term stabilization policies. The major ones during socialist were in 1972, 1982, 1986, 1988, and 1989 and during capitalism in 1992 and 1993 and in 2009.
- External conditionality. There were four periods of strong external conditionality, the two in socialism were in the early and late eighties and the two in capitalism were during the nineties and at the beginning of the century.
- International isolation. During the late nineties, the country was an international pariah and even though not economically isolated, there was political isolation.

Institutional instability, though not solely responsible, had a great influence on macroeconomic instability during the period. There was almost continuous macroeconomic instability during the period.

- Inflation. During the period, there were two bouts of hyperinflation, one in 1989 and the second 1993. In addition, there was one period of high inflation in 1982 and during socialism there were continuous inflationary pressures. The only period of price stability in Croatia's post 1945 history was from 1993 onwards.
- Negative growth. During the 36-year period, there were five periods/ years of negative growth rates. The negative growth rates in 1972, 1982 and 1999 and periods of negative growth during 1987-1990 and 1990-1992.
- Economic contraction. There were two multiyear economic contractions, in the late eighties and early nineties.
- Long-term economic deceleration. There was a 20 year period of economic deceleration that started in the early seventies
- Economic implosion. There were two periods of economic collapse. The first one was in the early eighties and it involved rationing other restrictions and one in the early nineties that coincided with the first experiences of transformation and war (generally speaking this aspect of Croatia's experience is unusual since war is not associated with negative growth rates but quite the opposite).
- External disequilibrium. There were multiple foreign exchange crises in 1972, 1987, 1989 and 1999 and once an almost default on foreign debts in 1982.
- Sectoral restructuring. A major cause of instability coming from a completely different source was the restructuring caused by transition. Even though at a lower pace than previously de-agrarization, urbanization, industrialization and emigration continued and changed the nature of the economy from a developing one, at the beginning, into an upper middle income economy by its end. This restructuring led to massive demographic changes and instabilities that are not specific to Croatia but can be seen in every country undergoing modernization.

For a better understanding of the variety of frameworks, the authors will present an extremely brief overview covering only the major events in chronological order. The overview will deal with events with regard to their importance for labour allocation and wage determination. In 1974 a major reform of the self-managing socialist economy started that defined the economic system until the end of the socialist period (in 1989). The reforms implied a contraction of markets (especially in comparison to the 1965 very pro-market reforms) and exchange became partially regulated by agreements that included prices (especially in the provision of public goods and services and foreign trade and currency). Labour allocation was free and unemployment partially open but there was only a semi-institutionalized labour market. There was indeed open unemployment but with partial health insurance and limited unemployment benefits, leaving most of the costs of being unemployed private. A labour exchange was organized with compulsory notification of vacancies but the labour office could have been by-passed once the vacancy was filled. The firm aggregate wage fund and wage differentials were regulated by 'self-managing agreements'. Thereby firms and other stakeholders signed up policy documents defining the framework for wages leaving a wide scope for firm's independence, their compositions and implementation backed by significant overt and covert political pressure. In line with previous wage frameworks, there were extensive firm related benefits and income subsidies (health, holiday resorts, education, etc.). This labour allocation and wage system (technically these were not wages but referred to as 'personal incomes' but for simplicity will be referred to here as wages) remained substantially unreformed until the end of the socialist

period in 1989. The major development over time was that it became less binding and increasingly by-passed. The new system produced a contraction with negative growth rates in 1972 and then a foreign debt and worker remittances led boom with the highest growth rate during the seventies.

The eighties started with a debt crisis, partially imported, in 1981 and with rising inflation. The government reacted with a heterogeneous stabilization package and crises control involving restrictions and price controls as well as a wage freeze. The policies worked with inflation and the trade deficit was reduced and debt default avoided. It also led to awareness that the socialist self-managing system required profound reforms. The reforms were unveiled in 1983, see Lazović (1983). They recommended increasing the scope of markets and even partial market determined interest rates and exchange rates and liberalizing employment. The proposals led to halfhearted implementation and once the economy was back on a growth track a new set of reforms that proposed a backtracking on market liberalization. These were published in 1986 but did not have a major formal influence since the economy was already in a downward spiral. Macroeconomic instability was increasing with growth rates falling, inflation rates rising and the trade balance worsening followed by a sequence of short-term stabilization policies, namely 'Targeted inflation' in 1986, 'May measures' in 1988, see Štiblar (1989) and 'Marković reforms' in 1990, see Marković (1990) and Unsigned (1990). None of them succeeded and amid macroeconomic instability marked by hyperinflation, breakdown of economic policy and balance of payment deterioration, there was political instability finally leading to the decomposition of the country in 1991. Croatian independence was militarily contested in the Croatian phase of the Wars of the Yugoslav Succession (referred to also as the Homeland War) that lasted from 1991 to 1995. Contrary to historical experience during the war unemployment increased and growth was very limited. Independence and 1990 also led to a regime change as socialism was dismantled and replaced by a kind of capitalism that developed along independent lines. Hyperinflation was stopped in 1993 by a heterodox stabilization plan and growth accelerated after the war with postwar reconstruction, see Anušić et al (1995). In 1999, there was a deceleration with negative growth rates. After the 2000 elections, there was a major change of government and capitalism was reformed. The period ended with the Croatian economy turned into a small open economy (population 4.1 million, GDP of 34.22 billion Euros in 2006) in the upper middle income class (per capita income in ppp dollars in 2007 was 15.050) and a secular growth rate of about 4-4.5%, see Moore and Vanvakidis (2008).

To sum up during the period there was a war (1991-1995), a major regime change (in 1989), a contraction of the internal market (in 1990), two major reforms during the socialist period (in 1972 and 1983) and one in capitalism (in 2000) and there were multiple stabilization policies in all regimes (1972, 1982, 1986, 1988, 1999, 1992 and 1993). Less directly linked to institutional change and policies there were two periods of hyperinflation (1989 and 1993) and one of high inflation (1982), five years of economic contraction (1972, 1982, 1990-1992 and 1999), a 20 year period of economic deceleration, one economic collapse, one occurrence of almost defaulting on foreign debts (1982).

It is understandable to expect that such a turbulent period would lead to changes in labour allocation, wage inequality and wage differentials. During the period all the accepted underpinnings of labour allocation and wage determination changed, some more than once. Some labor issues for the first period are discussed in Janković (1980), Šuković (1988) and Bićanić (1991) and for the second in Obadić (2005), Bićanić and Babić (2008) and Franičević and Puljiz (2009). Of course, the literature on both periods is voluminous so the above is a selection the authors used in their survey.

- Economic justice. With the regime change and the transformation, the notion of economic justice changed fundamentally. Socialism did not accept non-labour incomes (even though they existed, indeed in a roundabout way they were important) while capitalism does not distinguish sources of income. Socialism also formally had an egalitarian bias that is not present in capitalism.

- Labour allocation. The regime change also meant fundamental changes in labour allocation principles. Formally socialism did not accept labour markets and did not institutionally support them (there were informal and hence highly dysfunctional labour markets and extensive regulation) while capitalism introduced liberalized labour markets and later collective contracts. This had important consequences for wage determination.
- Wage determination. Under socialism wages were partially regulated and due to imperfections often included non-labour incomes and rents; many high wages or even whole sectors had non-monetary fringe benefits. Under capitalism, wages are largely 'freed' from non-labour incomes and rely on labour market conditions.
- Incomes policy. There were two aspects to wage policies. The first was medium term and involved wage differentials. Socialism had a strong system moral suasion about wage differentials and through 'self management contracts' stipulated that intra-firm relative range should be 1:8 and intra-sectoral average 1:4. This led to pressures of wage compression present in all socialist economies. Capitalism has no such regulation regarding wage differentials anywhere. The second was incomes policy in the frequent heterodox stabilization policies. Here policies do not differ and stabilization policies regularly imposed a wage freeze.

During most of the period under consideration, i.e. from its beginning in 1970 to 1991, Croatia was part of Yugoslavia and from 1991 to the end of the period in 2006 it was an independent state. While part of Yugoslavia, it was the second largest constituent republic in size (after Serbia) and the second most developed constituent republic (after Slovenia). According to the 1971 population census Croatia had 4.4 million inhabitants, 21.6% of the total population of Yugoslavia, in terms of social product (in current prices) in 1987 it had 26.9% of the Yugoslav social product, Its per capita social product was 27.7% above the national average. As an independent country by World Bank standards with a per capita income of 15.050 ppp dollars in 2007 it could be considered an upper middle-income economy (share of manufacturing industry and agriculture in 2006 in GDP was 15.9% and 5.9 respectively).

During the period there was another fundamental change regarding labour allocation and wage policies. While part of Yugoslavia, Croatia shared with it a common institutional framework with regard to labour allocation and wage policies. This also meant that it was part of the Yugoslav framework of labour allocation in which there was extensive labour mobility. Regarding Croatia, this implied workers from the least developed regions, especially Bosnia and Herzegovina freely competing for jobs, most often for the less well-paid requiring lower educational levels. Once it became independent, this labour mobility stopped.

3. CALCULATED INEQUALITY MEASURES

There are two inequality measures calculated in the paper, Gini coefficient and Theil index. While the former is a common and intuitively easily understandable measure the latter is less well know but has some important advantages. The Gini coefficient is "the average difference between all possible pairs of income in the population, expressed as a proportion of total income" (Cowell, 1995, p.23) and lies between 0 for an egalitarian distribution and 1 for maximum inequality. Intuitively the Theil index could be interpreted as a "direct measure of the discrepancy between the distribution of income and the distribution of individuals where a group that has the same share of income as the group's share of individuals does not contribute to inequality" (Conceicao, Galbraith, Bradford, 2000, p.3). The same authors also conclude that "the structure of the Theil index measuring inequality between individuals is similar to the Theil index structure measuring

inequality between groups" (Conçeição, Galbraith, Bradford, 2000, p.4) thus when aggregated data is available instead of individual data the between group element of the Theil index can be used as a lower bound for the population's value of Theil statistics unveiling the unobservable movement of the whole distribution. Monotonic transformation provides for the large sensitivity of income transfers from the poor to the rich, not seen when using linear measures. (Conçeição, Ferreira, 2000, p.13) Comparisons of the Theil index are less straightforward since its maximum values depend on the data, in this case on the number of income brackets or the levels of attainment. During the whole period there were 8 levels of educational attainment their number and specification did not change, while the 14 income brackets for the distribution of net wages can easily be reduced to the 13 published for the second part of the period. This allows the comparability of the Theil index during the period.

Each of the two inequality measures is calculated in two ways, once for ungrouped data and once for grouped data. The formula used for Gini coefficient for ungrouped data is given in equation (1) and for grouped data in equations (2) and (3) for lower and upper bounds. Equations (1), (2) and (3) are taken from Cowell (1995), pp.111-115 and p.147.

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

$$(2) \quad G_L = \frac{1}{2} \sum_{i=1}^k \sum_{j=1}^k \frac{n_i n_j}{n^2 \bar{y}} |\mu_i - \mu_j|$$

$$(3) \quad G_U = G_L + \sum_{i=1}^k \frac{n_i^2}{n^2 \bar{y}} \lambda [\mu_i - a_i], \lambda = \frac{a_{i+1} - \mu_i}{a_{i+1} - a_i}$$

where n is the number of observations, y is overall income, \bar{y} is average overall income, a are income classes with upper and lower boundary values, k is total number of income classes, μ is class mean and i is population relative frequency in income class i .

The formula used for the Theil index for ungrouped data is given in equation (4) and for grouped data in equation (5). Equations (4) and (5) are taken from Conçeição, Galbraith, Bradford (2000).

$$(4) \quad T = \sum_{i=1}^n \frac{y_i}{y} \log \left[\left(\frac{y_i}{y} \right) / \left(\frac{1}{n} \right) \right]$$

$$(5) \quad T_S = \sum_{i=1}^m \frac{y_i}{y} \log \left[\left(\frac{y_i}{y} \right) / \left(\frac{n_i}{n} \right) \right]$$

$T = \sum_{i=1}^n \frac{y_i}{y} \log \left[\left(\frac{y_i}{y} \right) / \left(\frac{1}{n} \right) \right]$ $T_S = \sum_{i=1}^m \frac{y_i}{y} \log \left[\left(\frac{y_i}{y} \right) / \left(\frac{n_i}{n} \right) \right]$ where n is the number of observations, y is overall income and m is the number of groups.

Equations (1) and (4) are used for calculating inequality of wage dispersion (in section 5.1.2) and are used with the data on average incomes for levels of educational attainment as well as for calculating wage inequality (in section 5.2.2) using data on both average incomes for levels of educational attainment and the data on the

distribution of net wages. Equations (2), (3) and (5) are used for calculating wage inequality (in section 5.2.1) using income data grouped by income brackets.

For the analysis of the development of the Theil index a stacked bar graph will also be presented in the following chapters. This bar, see Conceicao, Ferreira, (2000), is based on the decomposability of the Theil index and it shows the contributions of each subgroup to overall measured inequality. Thus Theil index has both positive and negative contributions with the positive ones always being higher due to weighting. The negative contributions are due to the group receiving less than its "fair share" of income, i.e. income share equal to the group's population share.

4. NOTES ON DATA

It is very difficult and, given the extent of instability, unusual to find comparable data relating to wage dispersion and wage inequality covering such a long period (for example till 1991 GDP was not calculated and social accounting was based on gross material product, reliable GDP estimates exist only for the period after 1995). In the case of Croatia there are two data sources which can cover the 36 year period from 1970 to 2006 and which can be used for the analysis of wage dispersion and wage inequality. The first data source is the distribution of registered fully employed workers according to net (take home) wage; during socialism these were called personal income and during capitalism the term pay was used. The second data source is the distribution of employed workers according to net wage for level of educational attainment (i.e. qualification level). Both data sources are used in the paper. The specific characteristics of each data source are discussed below.

4.1. DISTRIBUTION OF FULLY EMPLOYED WORKERS ACCORDING TO MONTHLY NET (TAKE HOME) WAGE

The distribution of fully employed according to their monthly net (take home) wage has been collected since March 1973, i.e. during the whole period. During socialism it was called personal income ('osobni dohoci') and during capitalism pay ('plaće') and in this paper it will be referred to as net monthly wage. The net monthly wage and employment data used in the paper were collected by the Croatian statistical office. Until 1990 this was the Republican Statistical Office (RZS) that was part of the Yugoslav system of statistics and from 1991 by the State Statistical Office (DZS). The distribution was regularly collected and was published in Statistical Yearbook of the Republic of Croatia during the whole period with the exception of an 8-year interval from 1998 to 1996 when it was published only in specialized statistical announcements. Until 2004 it was published only in paper form. The September 1991 data omits data for 23 communes and the data from March 1991 until March 1995 omits data from the temporarily occupied territories. With the end of the Homeland war in 1996 the data refers to the whole country as does the data before September 1991. The data from March 1973 until September 1991 is in dinars, from September 1991 until March 1991 in Croatian dinars and from September 1993 in kunas.

The data refers to persons in employment¹ and their net monthly earnings (take home wage). The data on the distribution of employed workers according to net take home wage is collected in a regular survey conducted by the official statistical office. Until 1989 this was the RAD-1 questionnaire completed by firms in the census and from 1996 by the RAD-1G questionnaire completed by firms. Until 1995 the survey was conducted twice annually, data referred to 31st March and 30th September (except in 1980 and 1981 when only September data was collected due to preparations for the 1981 population census). After 1996 it was collected once every year so the data refers to 31st March. The 1996 changes are a result of the completion of the Homeland war in 1995 after which statistics were re-organized. The survey, introduced back in 1963, includes legal entities of all forms of ownership, government bodies and bodies of local and regional self-government units. The annual survey does not include data for persons in employment in crafts and trades and free lances, in the Ministry of Defense, in the Ministry of Interior and independent farmers. Since 1998, the data on persons in employment has contained estimated data on persons in employment in the defense and police, while, since 2004, this data was included based on reports submitted by competent ministries. Also, since 1998 data on persons in employment includes those in crafts and trades and free lances. This data cover owners and employees registered with the Croatian Institute for Pension Insurance. (Statistical Yearbook, 2007, pp.79-85, 114-120).

The data was published in tables and contained the frequency for chosen income brackets. The brackets are chosen at the beginning of the year and the same brackets apply for the March and September data. As a result during periods of high inflation most of the distribution is grouped in a few income brackets making calculation unreliable, see Table 1. For example in 1989 more than half the distribution was in only two income brackets. The average of each income bracket and the average of the distribution were not calculated and hence are not available. This is because the data was provided by individual firms and then collected into a national distribution but the firms were not obliged to give the average for this distribution. Until 1996 there were 14 income brackets and after that 13 (see Table 1). Even though data disaggregated by sectors is not used here it is worth mentioning that the sector classification changed during the period (the Yugoslav sector classification changed twice during the period before 1991 and after 1996 the UN classification was used).

Table 1: The distribution of employed persons by monthly net earnings (take home wage)

YEAR	MONTH	% IN LOWEST BRACKETT	% IN TOP BRACKETT	MAX FREQUENCY	NUMBER OF INCOME BRACKETTS
1973	March	0,5	0,1	16,3	14
	Septemb.	0,0	0,4	19,3	14
1974	March	0,1	0,7	23,1	14
	Septemb.	0,0	1,2	23,9	14
1975	March	0,5	1,0	21,9	14
	Septemb.	0,2	1,7	19,7	14
1976	March	0,6	1,3	18,8	14
	Septemb.	0,3	1,8	17,8	14
1977	March	2,2	1,1	15,8	13
	Septemb.	1,1	1,6	14,8	13

¹ "Persons in employment are persons in paid employment, which includes persons who have signed a work contract with the employer for a fixed or unspecified period of time, irrespective of type of ownership and of whether they work full time or less than full time. Included in persons in paid employment are trainees, persons on maternity leave, on sick leave or absent from work for other reasons, until cessation of employment. Also counted as persons in employment are self-employed persons in own trade company, enterprise, craft or free lances." (Statistical Yearbook (2007), pp.79-85, 114-120)

1978	March	0,5	3,1	16,1	13
	Septemb.	0,4	3,9	17,3	13
1979	March	0,7	4,3	18,5	13
	Septemb.	0,4	5,4	18,7	13
1980	March	/	/	/	/
	Septemb.	0,2	9,2	16,6	13
1981	March	/	/	/	/
	Septemb.	1,3	1,5	12,9	13
1982	March	5,6	0,4	20,2	13
	Septemb.	2,6	0,5	19,3	13
1983	March	3,6	0,5	17,6	13
	Septemb.	1,4	1,0	15,7	13
1984	March	1,1	1,5	13,5	13
	Septemb.	0,3	4,0	23,5	13
1985	March	0,3	8,9	19,6	13
	Septemb.	0,4	13,5	14,9	13
1986	March	2,2	6,4	16,0	13
	Septemb.	0,1	24,4	24,4	13
1987	March	2,5	1,2	18,8	13
	Septemb.	2,2	0,8	20,3	13
1988	March	1,3	2,7	17,7	13
	Septemb.	1,2	3,9	16,6	13
1989	March	0,2	9,7	33,2	13
	Septemb.	0,4	5,0	22,1	13
1990	March	1,6	0,7	25,6	13
	Septemb.	0,6	2,0	19,0	13
1991	March	0,7	2,1	22,4	13
	Septemb.	1,9	2,3	21,3	13
1992	March	1,4	2,4	13,4	13
	Septemb.	3,5	3,1	13,4	13
1993	March	4,2	4,0	12,6	13
	Septemb.	8,6	1,2	20,5	13
1994	March	2,8	0,8	35,1	13
	Septemb.	2,2	1,4	36,1	13
1995	March	0,5	0,7	29,2	13
	Septemb.	2,6	2,0	13,6	13
1996	March	1,8	2,6	12,0	13
1997	March	2,8	3,5	12,1	13
1998	March	5,4	3,6	12,8	13
1999	March	5,7	2,0	13,6	13
2000	March	3,7	2,9	12,5	13
2001	March	0,9	4,1	12,3	13
2002	March	6	1,9	12,6	13
2003	March	4,0	2,5	12,2	13
2004	March	4,0	4,2	14,3	13
2005	March	7,4	5,2	11,4	13
2006	March	6	6,2	12,6	13

Source: Saopćenje RZS till 1991 and Priopćenje DZS after 1991, various issues

4.2. THE DISTRIBUTION OF THE EMPLOYED ACCORDING TO AVERAGE WAGE FOR LEVELS OF EDUCATIONAL ATTAINMENT

The second data set is the distribution of average earnings (net take home wage) for levels of educational attainment. Educational attainment is "the highest level of education acquired by a person upon completing an appropriate school or course, sitting for exams or receiving recognition based on proving educational attainment in a business entity. The level acquired can be proved by the appropriate official document (diploma, certificate, degree)." (Statistical Yearbook (2007), p.115) Since the official classification groups all Doctors, Masters and Bachelors under the University Degree variable, for simplicity and clarity of exposition, authors have decided to call that variable Advanced Degree (ADV). Advanced Degree is followed by the Non-university college degree (NUCOLL), Secondary school education (SEC), Basic school education (BASIC), Highly-skilled (HIGHSKILL), Skilled (SKILL), Semi-skilled (SEMISKILL) and Un-skilled (UNSKILL) levels.

During the whole period this data was collected bi-annually and published in the Statistical yearbook and in disaggregated form in specialized publications. The number of levels of educational attainment did not change and are in agreement with definitions used by the ILO. Together with the average net earnings of each level of educational attainment the average of the whole distribution is also published. The available data also includes the shares of each level of attainment in employment. During the period there is a gap in the data because for the years 1988-1996 the data was not collected so the 'socialist' period lasts from 1970 to 1988 and the 'capitalist' period from 1996 to 2006. This gap in the data coincides with the breakup of Yugoslavia (1990) and the Homeland war (1991-1995). However, the definition of level of educational attainment did not change so the data is comparable over the whole period.

5. INEQUALITY CHANGES

The chosen data bases allow the measurement of two aspects of the inequality of incomes from employment. The first is 'wage dispersion'. The inequality of this distribution is measured in section 5.1. The second is the standard interpretation of 'wage inequality'. The inequality of this distribution is measured in section 5.2.

5.1. WAGE DISPERSION

Wage dispersion refers to the differences and dispersion of nominal incomes for various professions. The analysis of wage dispersion is not concerned with the inequality of the distribution of wages but with the change and evolution of relative nominal wages so the value of the wage of a certain profession is the relevant data input. In the economy there are hundreds of professions and ideally, one would want a disaggregated database (e.g. the wage of a street cleaner, carpenter, accounting clerk, dentist, schoolteacher, etc.). For most economies such databases do not exist, especially not for any longer period and even where some values exist they are collected ad hoc and not by official statistical sources which makes comparisons very questionable. Croatia is no exception. The only data base that could allow the analysis of wage dispersion concerns not the wages of individual professions but the average net wage of different levels of educational attainment.

Croatian statistics recognize eight levels of educational attainment: Advanced Degree (ADV), Non-university college degree (NUCOLL), Secondary school education (SEC), Basic school education (BASIC), Highly skilled (HIGHSKILL), Skilled (SKILL), Semi-skilled (SEMISKILL) and Unskilled (UNSKILL) levels. The available database gives the average net wage for eight different levels of attainment. The recognized attainment levels did not

change during the whole period and are recognized ILO levels so the data is comparable with that of other countries. The averages represent averages of overlapping distributions (the net wage of the highest paid skilled worker may be higher than that of the lowest paid non-university college degree). The average net wage for each level of educational attainment is taken as an individual data point because the relationship of the averages is at issue here. Thus the share of any individual level of educational attainment is not relevant for the analysis of wage dispersion.

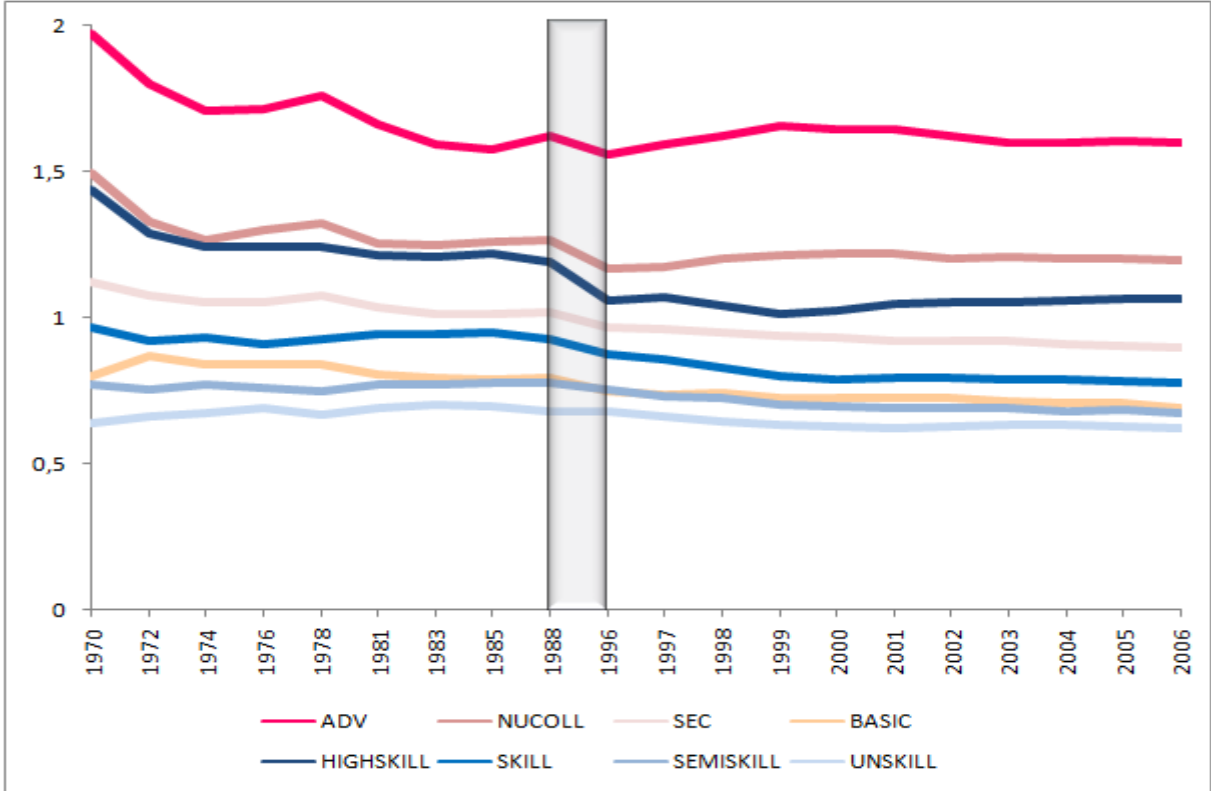
The characteristics of structural wage developments and wage dispersion, described as the distribution of average nominal wages for levels of educational attainment is analyzed in four ways, each in a separate subsection. In the subsection we follow the most often used approach to wage dispersion, i.e. the calculation of relative nominal average wages and the changes over time. The second subsection calculates the inequality of the distribution of the nominal wages' averages by using the two chosen inequality measures, i.e. Gini coefficient and Theil index. The third subsection calculates Lorenz curves for the averages. The fourth subsection offers a tentative analysis of the data of the previous three sections.

5.1.1. RELATIVE WAGES FOR DIFFERENT LEVELS OF EDUCATIONAL ATTAINMENT

The data used for wage dispersion contains the average nominal net wage for eight different levels of educational attainment. These eight averages are then treated as the data points for the individual year. The data allows for the calculation of relative wages for any given year (in this case the ratio of averages of different levels of educational attainment) and the changes of relative wages over time. The pattern of relative wages can be depicted in two ways.

Figure 1 depicts the changes of relative wages normalized by the average net wage in the economy. For example the bright red line shows the ratio of the average net wage of all workers with an advanced degree to the net average wage in the economy. The shaded area covers the period from 1988 to 1996 for which there is no data available (it was not collected). The figure seems to indicate two different periods. The first is from the beginning of the data collection in 1970 that lasts to 1988 and thus covers the 'socialist period'. In this period there was an overall wage compression interrupted by two periods of decompression, the first in the late seventies and the second in the late eighties. The second period is from 1996 onwards and covers the 'capitalist phase'. In the second period there is a remarkable constancy of the relationships of relative wages. Comparing the two periods there is much more instability in the first period than the second one. Another interesting feature indicated by Figure 1 is the remarkable stability of the ordering. During the whole period the lines do not cross indicating that the lexicographic ordering (i.e. first, second, third, etc.) of net wages by level of attainment was unchanged during the whole 36 year period.

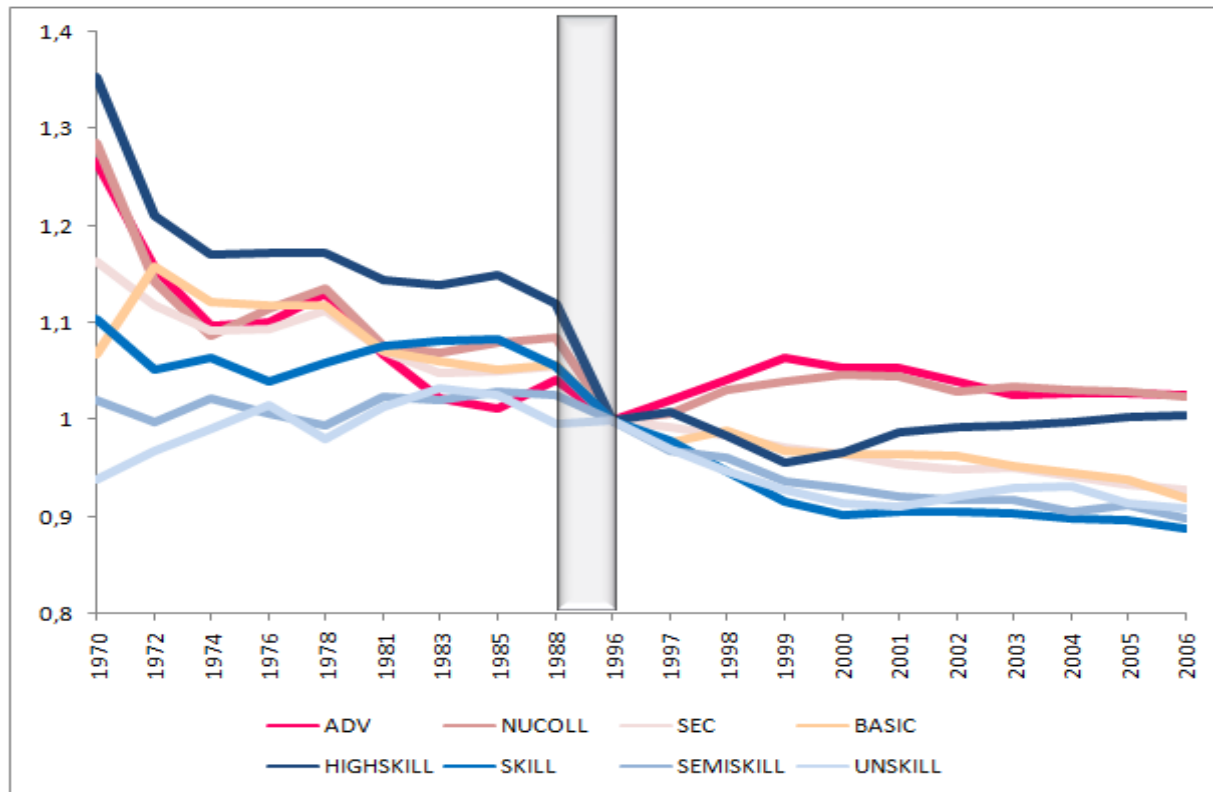
Figure 1. Annual changes of average net wage income according to attainment levels, 1970-2006



Source: Authors calculations based on DZS data, 1970-2006.

The difference of the two periods suggests that taking the year of discontinuity as a base year may offer additional insight. This was done in Figure 2 where 1996 is taken as a base year for which yearly changes are calculated. Again, this shows much greater instability during the first period than in the second.

Figure 2. Annual changes of average net wage income according to attainment levels, 1970-2006 (base=1996)



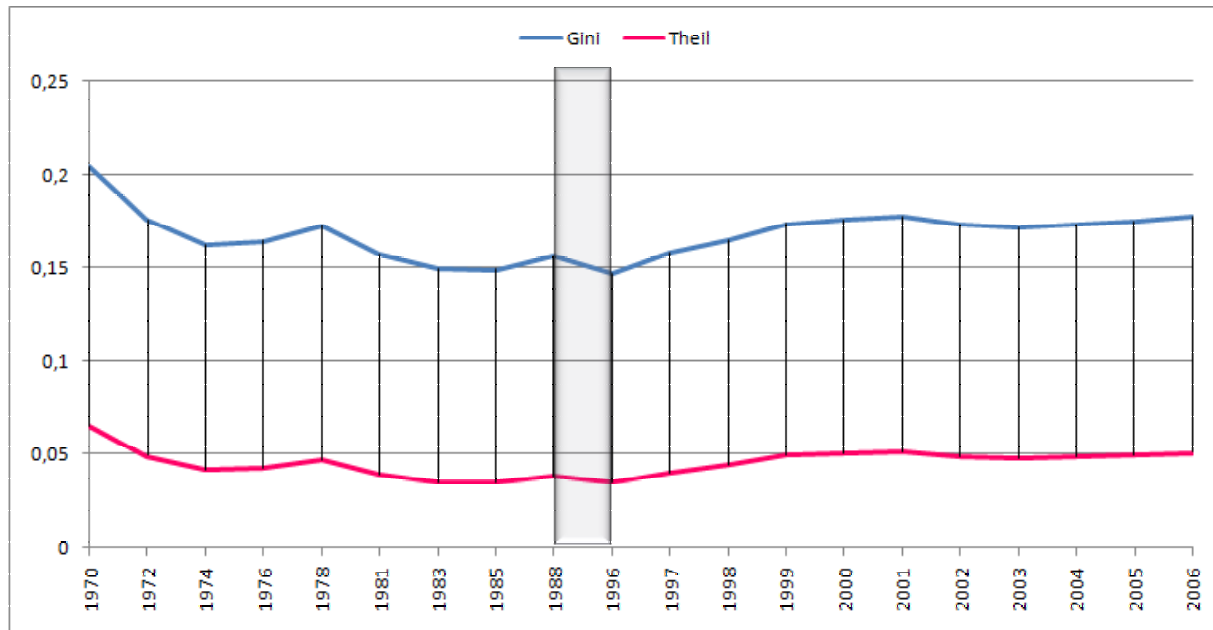
Source: Authors calculations based on DZS data, 1970-2006.

5.1.2. GINI COEFFICIENT AND THEIL INDEX FOR WAGE DISPERSION

The changes in the wage dispersion indicated by Figures 1 and two justify further analysis. The next step was to calculate wage dispersion. This was done by calculating Gini coefficient and Theil index for wage dispersion.

Both Gini coefficient and Theil index were calculated according to the formulas (1) and (4) presented in the previous section, i.e. for ungrouped data. This means the inequality measures were calculated by using the individual average wages of the eight different educational attainment levels as data points. Below in Figure 3 we reproduce the values of the Gini coefficient in the top line (blue) and for the Theil index in the bottom line (red). The values of the inequality measures are comparable over time. For Gini this is because its range is always between 1 and 0 and for Theil because the number of data points is the same in all years (the maximum Theil depends on the number of data points and has no intuitive meaning). The shaded area covers the period from 1988 to 1996 for which there is no data available (it was not collected). The data is given in the Appendix 1 to the paper.

Figure 3: Gini coefficient and Theil index for wage dispersion

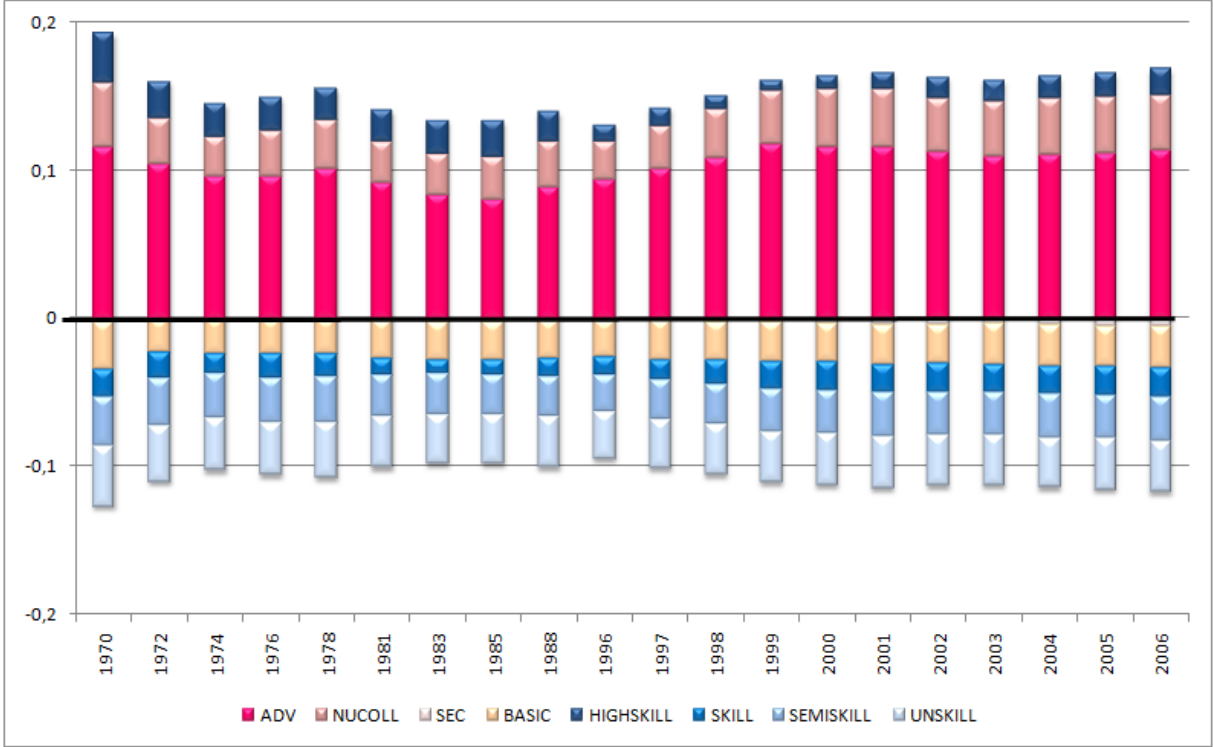


Source: Authors calculations based on DZS data, 1970-2006.

Both inequality measures during the whole period indicate the same direction of the changes and they show no convergence. Furthermore, they indicate the same kind of changes pointed to by Figures 1 and 2. But the inequality measures add a further insight regarding the second period where two sub-periods can be clearly identified. The first during which there was a decompression and which lasted from 1996 till 1999 and the second one after that during which there was almost unchanged structure of relative wages.

The Theil index allows for the analysis of yet another aspect of wage dispersion. Because it is a decomposable measure it permits for decomposition for different levels of attainment. The stacked bar graph given in Figure 4 depicts these changes. The averages of professions with a diploma are given in warm colours (red and pinks) while that of qualification in cold colours (shades of blues). Levels of educational attainment that contributed to the rise of Theil index have positive values, i.e. subgroups receiving more than their "fair share" of income. The negative values are due to the subgroups receiving less than their "fair share" of income. The stacked bar graph shows a remarkable constancy regarding the contribution to wage dispersion. During the whole period the main sources of inequality were wages of those holding an Advanced Degree (ADV). The group that is receiving the smallest share of income compared to its size is the lower qualified workers (UNSKILL and SEMISKILL). This is not a surprising result since the average wage normally rises as workers climb the educational/ skills ladder. It is worth mentioning though that the wages of the workers with secondary school education (SEC) did not contribute to inequality at all and that more than the "fair share" of income also went to highly skilled workers (HIGHSKILL) as well as to workers holding a Non-university college degree (NUCOLL).

Figure 4: Wage dispersion - contributions of attainment groups to Theil index



Source: Authors calculations based on DZS data, 1970-2006.

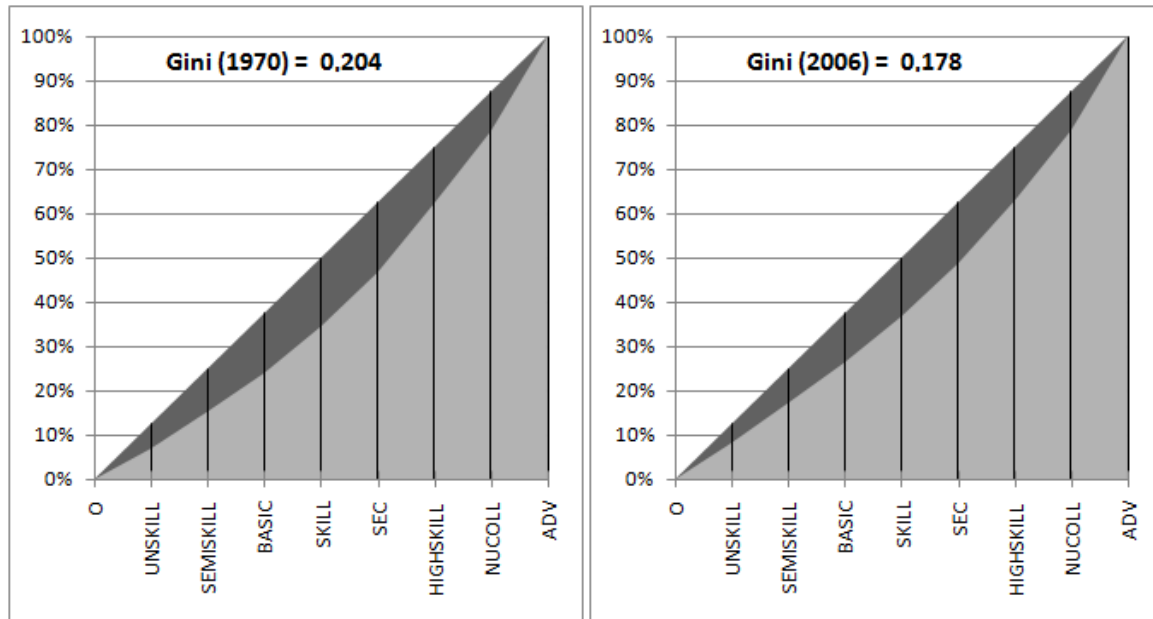
5.1.3. LORENZ CURVES

A third way of looking at wage dispersion is presented below, i.e. applying Lorenz curves. Graphically, the Gini coefficient is the area enclosed between the Lorenz curve and the diagonal (representing perfect equality) divided by the total shaded triangle (see Figure 5). Even though Gini coefficient is a sufficiently simple measure of inequality allowing for an easy interpretation, it can hide differences in income distributions even for economies with similar coefficients, resulting from the Lorenz curves having different shapes.²

The Lorenz curves for the initial year (1970) and the final year (2006) are given in Figure 5 below. The Lorenz curves show that the final year curve (for 2006) dominated the initial curve (for 1970) and thus unquestionably indicated greater wage dispersion at the beginning of the period than at its end.

² For more detailed discussion on Gini coefficient see Yitzhaki (1997).

Figure 5: Lorenz curves for average net wage income according to attainment levels, 1970 and 2006



Source: Authors calculations based on DZS data, 1970-2006.

5.1.4. INTERPRETING THE MEASURED CHANGES IN WAGE DISPERSION

All three approaches to wage dispersion in Croatia during the analyzed period, from 1970 to 2006, indicate the same over-all patterns of changes. These results can be summarized as follows:

1. Wage dispersion at the end of the analyzed period was lower than in the beginning.
2. There was a remarkable level of stability of wage dispersion during the transformation.
3. Within this general framework of stability slow changes can be recognized. There was a slow decrease till 1996 (because of the data gap it seems faster and larger than it actually was) followed by a small increase till 2001 and stability after that.
4. There is a remarkable level of stability in the structure of relative wages.

The first result is certainly an unexpected result and at odds with the paradigm. The paradigm would lead one to expect two things. First, lower differentials during 'socialism' due to its egalitarian bias and second, higher differentials after the end of transformation. Results do not confirm this. The second was also an unexpected result in the sense that one would expect a major wage decompression with the transformation induced labour market liberalization. This decompression would be reflected not only in rising levels but also in a certain level of instability. This was not the case, not only is there a very small decompression but after 2000 the differentials remain almost unchanged. The third result is not necessarily unexpected but refers to the stability of the ordering of relative wages. During the whole period the cardinal ordering (i.e. the ranking) of the averages remains unchanged.

Regarding the shorter sub-periods tentative explanations can be offered. The instability during the 'socialist' period is not unexpected. The two compressions of the wage differentials during first period, the first and larger one in the early seventies and the second around the eighties, coincide with falling growth rates,

macroeconomic instability and incomes policy. To this, one should add a paradigm change in the early eighties that unquestionably increased the socialist egalitarian bias (a retreat from markets and introduction of the associated labour reforms). The decompressions during the socialist period can also likely be linked to growth. In the late seventies there was import led growth and an economic upswing. The very slight decompression of the late eighties offers no straightforward explanation. In Croatia (and Yugoslavia) during that period there was no economic upswing and there was increasing macroeconomic instability. The decomposition of the 'capitalist' period into two periods cannot be so strongly linked to growth. It is most likely linked to the events of 2000 and the regime change but the explanation of stability after 2000 requires further research.

5.2. WAGE INEQUALITY

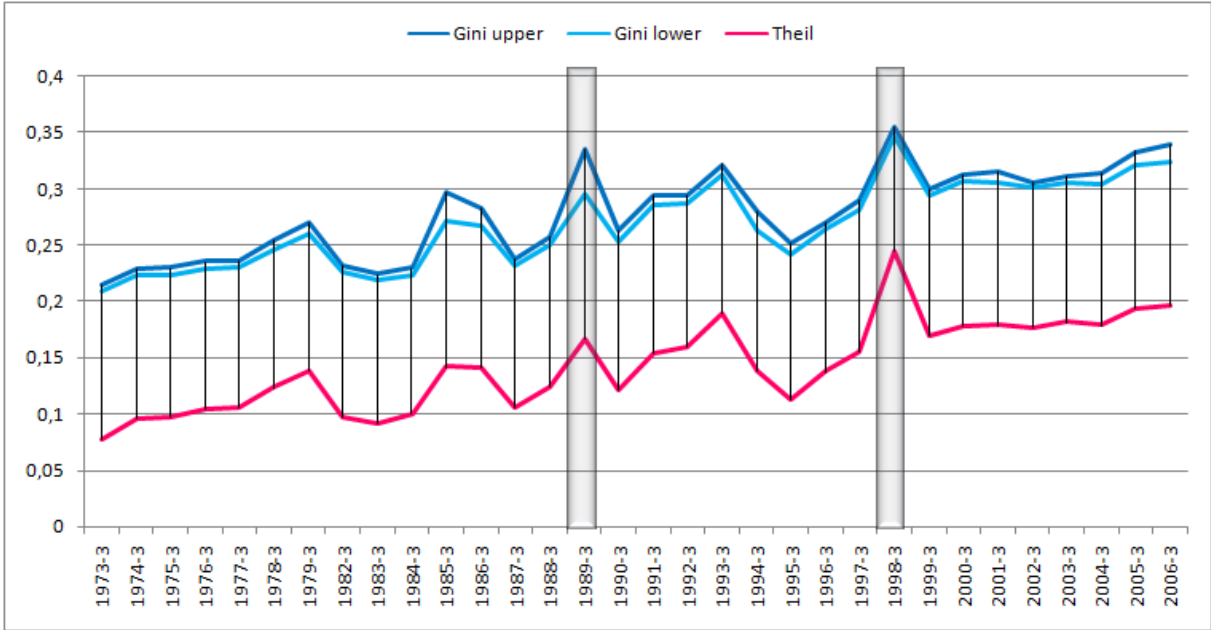
While wage dispersion can trace changes in the relative dispersion of wages it cannot indicate changes in the distribution of wages and overall inequality of wages. The common approach for this is to use a distribution of net wages and calculate its inequality. Ideally, following Lydall (1968) and Phelps (1977), one would want the distribution of a certain age cohort homogenous in all ways except with regard to wages, e.g. the distribution of net wages of full time employed by gender/ nationality/ race of a certain age. These distributions are, however, almost nonexistent so one is forced to use 'contaminated' data involving heterogeneous individuals.

In the case of Croatia two data bases can be used for calculating wage inequality. The first is the distribution of all fully employed workers by net wage and the second using the data on the distribution of employed by average net wage according to the level of educational attainment. The results of the measurement of each of these data sources are given in the sub-sections of this section while the third subsection attempts to summarize the data. The final section compares the calculations on wage inequality from employment statistics with the inequality of labour incomes derived from household surveys.

5.2.1. GINI COEFFICIENT AND THEIL INDEX OF THE DISTRIBUTION OF NET WAGES OF FULLY EMPLOYED

One distribution that can be used for analyzing wage inequality is the distribution of all fully employed workers (i.e. 182 hours a month that means all partially employed are omitted) by their net (take-home) wage. All fully employed workers are included, i.e. regardless of their age and other characteristics. This database, as discussed above in section 4.1, is available for Croatia but the average of the distribution is not calculated. However an alternative data source (initially the Social Accounting Service, SDK, and now the Financial Agency, FINA) calculates the average net wage for all employed. This average includes part time workers and overtime. This average is then used in the publications of the State statistical office. The two data sources were combined for calculating Gini coefficient and Theil index, formulas (2), (3) and (5) were used. The results are depicted in Figure 6 the blue (top) line is for Gini coefficient and the red (lower) line for Theil index. For Gini coefficient the upper and lower values were calculated. The former by assuming a maximum inequality in every income bracket (that all income recipients in the bracket have either max or min income) and the latter by assuming no inequality in any wage bracket (that all income recipients in the bracket have the income equal to the arithmetic mean of the income bracket). The actual values of the measures are given in Appendix 2.

Figure 6: Gini coefficient and Theil index for distribution of net wage of fully employed workers

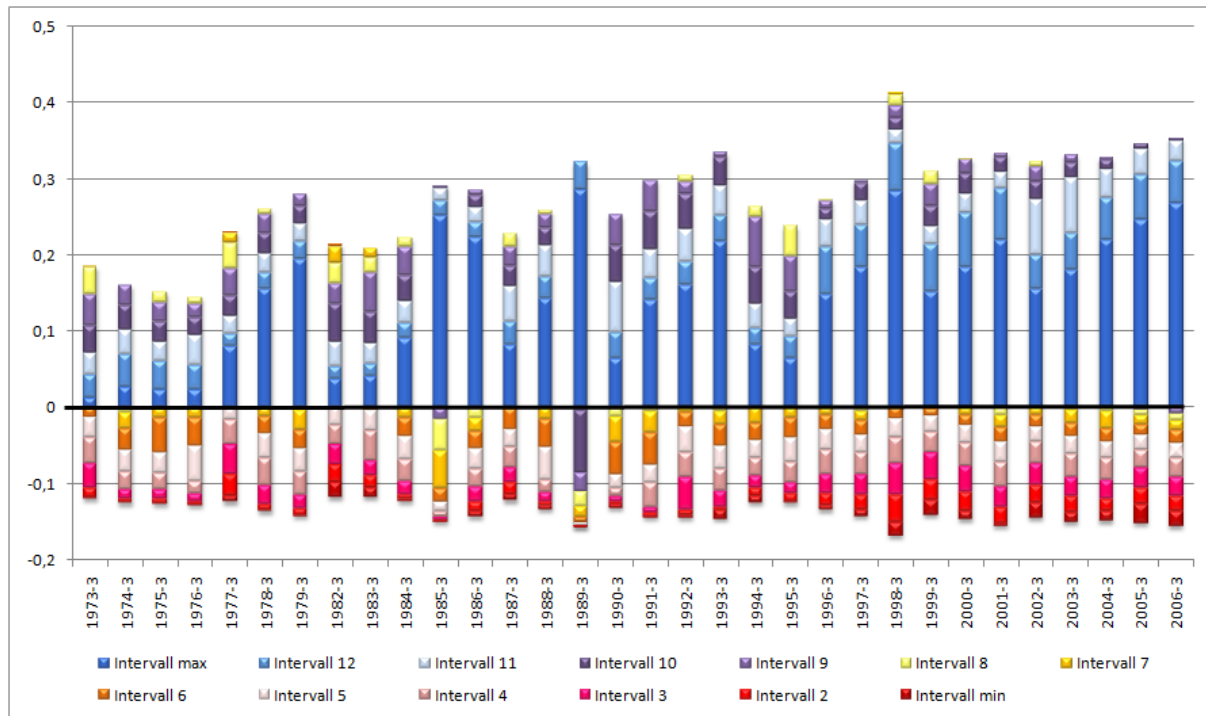


Source: Authors calculations based on DZS data, 1970-2006.

Looking at Figure 6 it is clear that both Gini coefficients and Theil index show the same dynamics of a secular increase in wage inequality. The initial, 1973 Gini was 0.21 and the final, 2006 Gini was 0.33 (compromise values). Figure also indicates a period of stable increases at the beginning (from 1973 to 1979) and end (from 2000 to the latest data for 2006) with cyclical variations around a rising trend between them. There were two periods of exceptional three-year increases in wage inequality, the first from 1987 to 1989 and the second from 1995 to 1998. Irregularities in the data aside, an explanation for the cyclical behavior of the inequality measures requires additional research.

As mentioned in the section on wage dispersion, a very useful characteristic of the Theil index concerns its decomposability. This allows the determination of those parts of the distribution that contribute to inequality by either receiving a higher or lower than proportionate share of income. The results are given in the stacked bar graph of Figure 7 in which the upper income brackets are in cold (blue) colours and the lower ones in warm (red and pink) colours. From Figure 7 it is clear that during the whole 'capitalist' era the main generators of inequality, receiving more than their "fair share" of income, were the top three income brackets. In the seventies that was not the case and income was largely redistributed among the middle income groups, coloured in orange, yellow and purple (for upper middle income class). Since around 2000 onwards the lower than proportionate share of the lowest income brackets remained relatively unchanged.

Figure 7: Wage inequality - contributions of income groups to Theil index



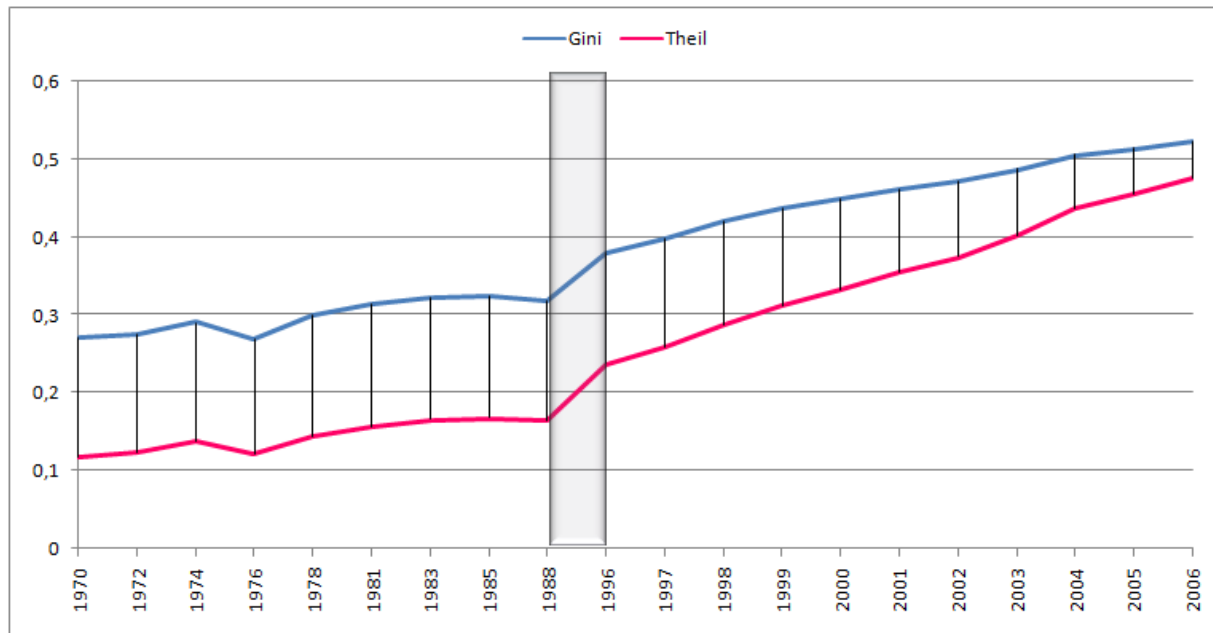
Source: Authors calculations based on DZS data, 1970-2006.

5.2.2. GINI COEFFICIENT AND THEIL INDEX FOR WEIGHTED DISTRIBUTION OF EMPLOYED BY LEVELS OF EDUCATIONAL ATTAINMENT

In this section we present a further, alternative way of measuring wage inequality in Croatia. It uses data for average income for levels of educational attainment and the share of each level in aggregate employment. In contrast to the previous calculations for wage dispersion here population subgroup weights are used in the formulas. The weights are the shares of each educational attainment level subgroup in aggregate employment. Obviously this is the case where overall employment is calculated from point data representing overlapping distributions. This approach that measures overall inequality from averages of overlapping distributions whose share in the aggregate distribution is known is not uncommon. It is regularly used in two contexts relating to spatial inequality and convergence, i.e. of countries and regions. The first is when country averages are used to measure world inequality. Using country averages obviously implies taking overlapping distributions regardless whether the averages are used unweighted, as in Sala-i-Martin (1992) (no or faulty reference!), Jones (1997) or Quah (1997) (no or faulty reference!), or weighted, as in Ram (1989) and Firebaugh (1999). The second is the same procedure but instead of countries it is applied to regions. Regional inequality is measured by measuring the distribution of regional average incomes which again implies overlapping distributions. Examples are in Geppert et al (2005) or Petrakos et al (2008).

The results of the measurement are depicted in Figure 8 and the actual values are given in Appendix 2. As previously the grey area indicates the data gap.

Figure 8: Gini coefficient and Theil index for weighted distribution of employed by attainment levels

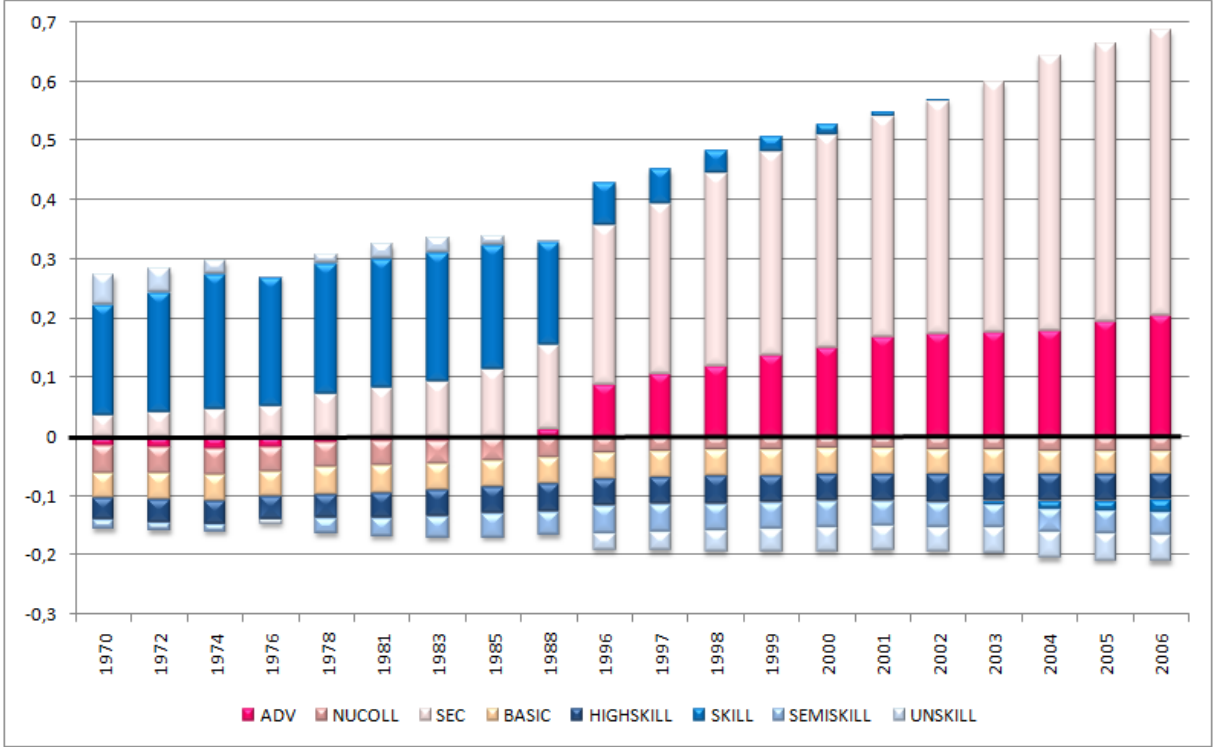


Source: Authors calculations based on DZS data, 1970-2006.

Figure 8 shows that both inequality measures during the whole period moved in the same direction. The figure also indicates an almost continuous rise in wage inequality during the period from 1970 when Gini was 0.27 to 2006 when the Gini, at 0.52, was almost double the initial value. Both inequality measures indicate only two periods of a slight decrease in inequality, the first from 1974 to 1976 and the second from 1985 to 1986. It is important to note that the gap between the two measures decreases over time. Because of the special characteristics of the Theil index and its large sensitivity to income transfers from poor to rich, the increasing slope indicates that during the period there was a redistribution of income towards the higher incomes. Since the data is for levels of educational attainment and the highest average is for those with an advanced degree this would indicate redistribution in their favour. The fact that the return on education has been increasing, see Šošić (2003), only confirms this.

The stacked bar graph, which depicts the contributions of various attainment groups to the Theil index is shown in Figure 9. Like before the levels of qualification are in cold colours (shades of blue) and levels of education in warm colours (reds and pinks). The stacked bar graph indicates an important difference between the first, 'socialist' period and the second, 'capitalist' period. During the first the main source of wage inequality came from the skilled workers (SKILL) while during the second the main source of inequality came from workers with secondary school education (SEC) and only after that from those holding an advanced degree (ADV). This is probably due to the 'degree' inflation since globally which means that the share of those with only secondary school education has decreased causing the remainder of the group receiving higher than proportional share of income.

Figure 9: Wage inequality: contribution of attainment levels to Theil index

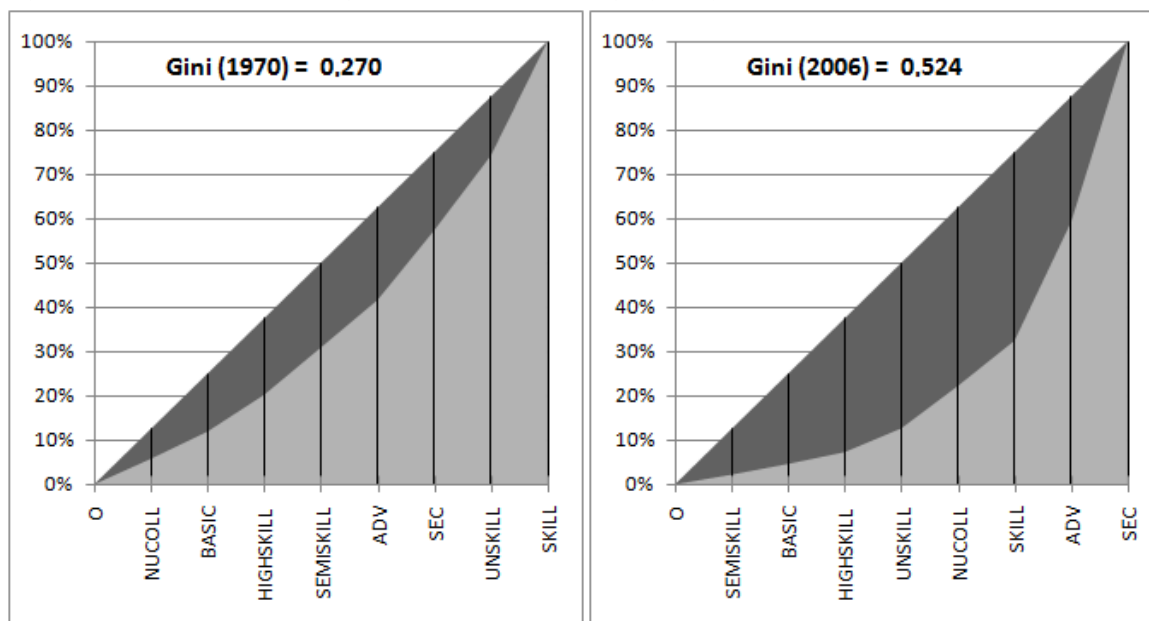


Source: Authors calculations based on DZS data, 1970-2006.

5.2.3. LORENZ CURVES

The distribution also allows drawing Lorenz curves. In Figure 10 only the initial one for 1970 and final one for 2006 are shown and they clearly indicate the Lorenz dominance of the initial distribution confirming that initial wage distribution was more equal than the final one.

Figure 7: Lorenz curves for weighted distribution of employed by attainment levels, 1970 and 2006



Source: Authors calculations based on DZS data, 1970-2006.

5.2.4. INTERPRETING THE MEASURED CHANGES IN WAGE INEQUALITY

Summarizing the results on wage inequality indicated by both measures clearly indicate the following main features:

1. During the whole period there was a secular rise in wage inequality.
2. The inequality of the final distribution is unquestionably more unequal than the initial one.
3. Until 1999 there were cycles around the raising trend but after 2000 the increase in wage inequality was stable.

Regarding the contribution to wage inequality of wage differences the data indicates that the main contribution to inequality is made consistently by the upper income brackets at the expense of the lower of the distribution. Regarding the contribution to wage inequality by different levels of educational attainment the data shows that in the 'socialist' era skills overruled degrees so that the larger than proportionate income share went to skilled workers while during the 'capitalist' era the main contributors to inequality were those with secondary school education and to a lesser extent those with an advanced degree. Former probably contributed not on the grounds of rising average wage but on the grounds of falling population within the group.

Looking ('eyeballing') at the data for the distribution of fully employed by net wage one can clearly see dynamic changes and cycles till 1999. The cycles have a remarkable similarity (other data does not have cycles). There were four cycles altogether. In the first three there were four years from maximum to maximum (the first from 1979 to 1985, from 1985 to 1989, from 1989 to 1993) and the fourth one lasted five years (from 1993 to 1999). Two cycles were in the socialist phase (the first two) and two in the capitalist phase (the last two). Three can be directly matched with a stabilization policy package involving wage policy (1985 'Vrhovec report', 1989 'May measures' and 1993 'Škegro package'). Given the nature of the data collection (a maximum in 1979 and the next data point is in 1982) perhaps even the first cycle can also be linked to stabilization policies (in 1981 the

‘Planinc package’). In this case the implementation of the policy package would have an immediate effect on reducing wage inequality and a return to the rising trend after one or two years. A stronger link could only be established through more careful analysis of the policy packages involved. Of course, the mirror image of the stabilization and anti-inflationary packages is the inflation rate with rising inflation leading to wage inequality.

While changes in wage inequality could perhaps be linked to policy regimes it does not seem there is a strong link with growth (with justification one could expect rising and high growth rates to be liked with tight labour markets, low unemployment, labour shortages generated by matching and rising wage inequality). This is certainly not true of the eighties when growth was sluggish during the whole decade (from 1980 to 1985 social product in 1972 prices increased 0.8% and from 1986 to 1990 it fell by 10.9%, during the whole period 1980 to 1990 it decreased by 7.6%) nor of the rising wage inequality during the Homeland war (1991 to 1995).

In the case of Croatia the only results these in the paper can be compared to is the inequality of labour incomes derived from household surveys. The inequality of this distribution was calculated by Nestić (2002) and the results are given in Table 2. When comparing them to the calculations in this paper one should bear in mind that labour incomes as defined in household surveys are a wider category than wages, the difference being the labour incomes of managers and selfemployed.

Table 2. Inequality of labour incomes from household consumption surveys

Year	Lower boundary	Upper boundary	Compromise value
1988	0,195	0,33	0,234
1998	0,215	0,367	0,253

Source: Nestić, 2002, p.607

6. CONCLUDING REMARKS

In the paper we deal with two aspects of the inequality of wages from employment. The first is wage dispersion, i.e. the relative wages for different levels of educational attainment, and wage inequality, i.e. the distribution of employed by net wages.

During the 36 year period from 1970 to 2006 there was a slow decrease in wage dispersion but an important increase in wage inequality (the two results can be reconciled by changes in the structure of employment). For most of the period wage inequality shows a cyclical behavior (three four-year and one five-year cycle) which can probably be linked to policy changes but has no immediate link to economic growth. Wage dispersion however, shows much more stability. The changes are smaller and the lexicographic ordering of relative wages by level of educational attainment does not change.

What is most remarkable however is that both data sets show that after the year 2000 there was stability. Wage dispersion did not change while wage inequality rose steadily (the cycles disappeared). This regime change can be linked to neither any policy change nor to growth change.

Finally, it is important to note that in all measurements and during the whole period both inequality measures, i.e. Gini coefficient and Theil index, indicate the same direction of change. In spite of this both measures have their uses, Gini because of its range between 0 and 1 and thus clearer understanding of changes and Theil because of its large transfer sensitivity and decomposition properties measuring the contribution to inequality.

APPENDIX 1.

Table A1. Inequality measures - wage dispersion for distribution of average wage by attainment levels

	1970	1972	1974	1976	1978	1981	1983	1985	1988	1996
GINI	0,20	0,18	0,16	0,16	0,17	0,16	0,15	0,15	0,16	0,15
THEIL	0,07	0,05	0,04	0,04	0,05	0,04	0,04	0,04	0,04	0,04

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
GINI	0,16	0,17	0,17	0,18	0,18	0,17	0,17	0,17	0,18	0,18
THEIL	0,04	0,04	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05

Source: Authors calculations based on DZS data, 1970-2006.

APPENDIX 2

Table A2. Inequality measures - wage inequality for distribution of net wage of fully employed workers

	1973-3	1974-3	1975-3	1976-3	1977-3	1978-3	1979-3	1982-3
GINI upper	0,21	0,23	0,23	0,24	0,24	0,25	0,27	0,23
GINI lower	0,21	0,22	0,22	0,23	0,23	0,25	0,26	0,23
THEIL	0,08	0,10	0,10	0,10	0,11	0,12	0,14	0,10

	1983-3	1984-3	1985-3	1986-3	1987-3	1988-3	1989-3	1990-3
GINI upper	0,22	0,23	0,30	0,28	0,24	0,26	0,34	0,26
GINI lower	0,22	0,22	0,27	0,27	0,23	0,25	0,30	0,25
THEIL	0,09	0,10	0,14	0,14	0,11	0,12	0,17	0,12

	1991-3	1992-3	1993-3	1994-3	1995-3	1996-3	1997-3	1998-3
GINI upper	0,29	0,29	0,32	0,28	0,25	0,27	0,29	0,36
GINI lower	0,29	0,29	0,31	0,26	0,24	0,26	0,28	0,35
THEIL	0,15	0,16	0,19	0,14	0,11	0,14	0,15	0,24

	1999-3	2000-3	2001-3	2002-3	2003-3	2004-3	2005-3	2006-3
GINI upper	0,30	0,31	0,32	0,31	0,31	0,31	0,33	0,34
GINI lower	0,29	0,31	0,31	0,30	0,31	0,30	0,32	0,32
THEIL	0,17	0,18	0,18	0,18	0,18	0,18	0,19	0,20

Source: Authors calculations based on DZS data, 1970-2006.

Table A3. Inequality measures - wage inequality for weighted distribution of employed by attainment levels

	1970	1972	1974	1976	1978	1981	1983	1985	1988	1996
GINI	0,27	0,28	0,29	0,27	0,30	0,31	0,32	0,32	0,32	0,38
THEIL	0,12	0,12	0,14	0,12	0,14	0,16	0,17	0,17	0,16	0,24

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
GINI	0,40	0,42	0,44	0,45	0,46	0,47	0,49	0,51	0,51	0,52
THEIL	0,26	0,29	0,31	0,33	0,35	0,37	0,40	0,44	0,46	0,48

Source: Authors calculations based on DZS data, 1970-2006.

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Priopćenja DZS: Struktura zaposlenih prema visini prosječne neto plaće po djelatnostimja, various years

Saopćenja RZS: Struktura zaposlenog osoblja po granama prema visini osobnih dohodaka, various years