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TRANSFORMATION**

By

Saul D. Hoffman, Ivo Bićanić, and Oriana Vukoja

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Wage Differentials and Wage Inequality in Croatia, 1970-2008: Assessing the Labor Market Impact of Economic Transformation

Saul D. Hoffman, Ivo Bićanić, and Oriana Vukoja

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Abstract: In this paper, we examine wage inequality and wage differentials in Croatia from 1970 to 2008. We focus especially on changing income inequality related to educational and vocational attainment, changing income inequality within those groups, and how these two components of inequality were affected by the economic transformation from Socialism to capitalism. We find that income inequality between groups was relatively stable, while overall inequality trended upward in the post-transformation period. This finding is consistent with a growing importance of individual rather than group productivity in labor market compensation, a change broadly consistent with the economic transformation of the Croatian labor market.

JEL Codes: J3, P2, P23, E34

Keywords: Croatia, Economics of Transition, Inequality, Gini coefficient

Hoffman, Professor of Economics, University of Delaware; Bićanić, Professor of Economics, University of Zagreb; Vukoja, Teaching Assistant, University of Zagreb. This research was supported by Title VIII funds from the U.S. Department of State through a grant administered by the University of Delaware.

1. Introduction

In this paper, we examine wage inequality and wage differentials in Croatia from 1970 to 2008. This period covers, of course, a tumultuous time for Croatia and the Croatian economy: the economic transition from socialism to a market-based economy, the break-up of Yugoslavia, two bouts of hyperinflation, and the Homeland War. Croatia is a particularly interesting place to examine the impact of economic transition because its form of central planning was far more decentralized and market-related than most other transition economies. We focus especially on changing income inequality related to educational and vocational attainment, changing income inequality within those groups, and how these two components of inequality were affected by the economic transformation.

Relatively little is known about inequality and wage differentials in Croatia over this time period, with almost all of the previous research based on household income surveys and covering a relatively short time period. We use, instead, a long time series of data from two official wage series based on a much fuller coverage of the workforce. These data sources enable us to assess changes in wages by skill level as well as changes in the overall distribution of income and also to look before, during, and after the economic transformation. The different focus of the two data series also enable us to identify some of the underlying sources of the changing inequality we find. Our goal in this paper is, therefore, twofold: to provide a fuller picture of inequality in Croatia over this longer time period as well as provide some insight into the effects of the economic transition and other significant events on the nature of inequality in Croatia.

We find that average wage differentials by education and vocational training narrowed from 1970 through about the early to mid-1980s, increased in the mid to late-1990s and then stabilized in the 2000s at a level a bit below the 1970 peak. Our broader measure of inequality by income groups shows

a similar pattern through the mid-1980s, but thereafter it increases far more rapidly, with the Gini coefficient rising from the .20-25 range between 1970 and the mid-1980s to .30 and over since the late 1990s. The greater post-transition increase in overall inequality than in inequality related to differences by education and vocational attainment suggests rising income inequality within educational and vocational attainment groups, a change consistent with a labor market that rewards individual skills more strongly. This change is broadly consistent with developments in other economies, including the U.S., and with the transformation from a centrally planned to a market economy.

The plan of this paper is as follows. Before turning to the measurement of inequality, we begin, in the next section, with background on the labor market framework and institutions that characterized Croatia during these years. The third section discusses the relatively small literature to date on Croatian income inequality. In Section IV, we outline the data and methods we use. Our analysis of wage dispersion and wage inequality in Croatia and how it was affected by the economic transformation is presented in Section V.

2. Labor Markets in Croatia - Background and Institutional Details

The almost 40 year period under consideration can be divided into two nearly equal sub-periods – the socialist period that lasted through 1989 and the capitalist period that followed. The beginning of the capitalist period coincided with what were arguably the greatest changes in Croatia's recent history: the break-up of Yugoslavia and the establishment of sovereign Croatia and the ensuing Homeland War of 1990-1995. In addition to these fundamental changes, Croatia also experienced two bouts of hyperinflation between 1989 and 1993 and numerous smaller shocks, including the socialist reform project during the early 1970s and mid-1980s, the oil shock and foreign debt crises in the early 1980s, and policy changes linked to stabilization policies in the early 1970s, the early and late 1980s, and the early 1990s.

In the socialist period, labor in Croatia had a special position by virtue of Croatia's relationship with Yugoslavia and its unique socialist ideology.¹ On the one hand, social justice was based on labor contributions ('distribution according to labor and results of labor') and labor was not accepted as a genuine market commodity, so that labor markets were not institutionally recognized. On the other hand, the socialist ideology in Yugoslavia included two important characteristics that affected the labor market. First, the practice of workers' self management, introduced in 1952, implied substantial firm independence and market exchange. Second, directive/central planning was abolished in practice in 1949 and institutionally in 1951. These two features made the Yugoslav/Croatian variation a special and separate form of socialism formally called "self-managing socialism" and often referred to as the 'Yugoslav experiment.'

The Yugoslav experiment had a built-in flaw concerning the pricing of capital, a flaw that had major repercussions for labor outcomes.² Because self-managed firms paid no price for the capital resources they used, they were free to distribute net income, including capital income, to workers once interest on loans and taxes were paid. The consequences of this were far-reaching and led to substantial allocative inefficiency. For example, capital became territorially immobile to protect rents and to maintain informal control of capital income, while capital-intensive sectors had a greater opportunity for higher wages due to the higher capital income available for distribution. This created the opportunity for greater wage differences than might normally exist in a centrally-planned system, although undoubtedly less than in comparable capitalist economies. Labor market policies during the whole socialist period largely concentrated on neutralizing the effects of this flaw. Regulations and policies were developed to

¹ Some English sources for the material covered in this section include Lydall (1984), Schrenk et al (1979), Čičin-Šain and Ellis (1986), Mencinger (2000), Lang et al (1982), and the edited volumes prepared for the regular Opatija yearly conference of Yugoslav economists published under the title *Current Problems of Economic Changes and Economic Policy of Yugoslavia* (Korišić, 1973, 1975, 1977; Nikić, 1980, 1982).

² An early discussion is Ward's 'Illyrian firm' (Ward, 1958). Yugoslav/Croatian economists were also well aware of the problem and its effects.

protect investments and accumulation from being crowded out by wages and to neutralize the effects of different sector capital endowments. Formally, this was attempted through a complex system of 'social compacts' and 'self-management agreements' that constrained the enterprise's freedom in the distribution of income and regulated inter-sector average wages.

Whether or not Croatia had genuine functioning labor markets during this time period is open to debate. On the one hand, the population could freely move and choose where to work and firms were formally free to choose their employees. The institutional framework included the registration of and support for unemployed workers³ and an employment agency. Thus, in contrast to centrally planned economies, 'open' unemployment was recognized. Also, there were trade unions and a legislative framework for labor relations, and, via Yugoslavia, Croatia was a member of the ILO. With the exception of periods with particular stabilization policies, firms had complete formal freedom to choose who to employ, following a formal procedure that required public (and hence transparent) advertising vacancies and new jobs.

On the other hand, the actual system did not operate according to market principles in three important respects. First and probably most important, there was no wage equalization and hence the 'law of one price' was in no way applicable to labor, nor were wages the dominant allocative principle in the labor market. Workers performing the same jobs could and did receive vastly different remunerations, including money wage and firm-related fringe benefits, largely due to the capital income issue discussed above. Second, the legislative framework still guaranteed almost complete job security and provided incentives for over-employment. The dramatic rise in unemployment and labor-shedding in the first years of transformation indicate the wide scope of over-employment and disguised unemployment (World Bank, 1996). Third, there was a strong outside ideological pressure on firms and

³ All vacancies had to be registered, but filling them was deregulated.

their labor relations practices. This pressure was both overt, through legislation and regulation, and covert, via political pressure, but in both cases market considerations were secondary. On balance, we believe that even though some of the institutions of labor markets existed, labor allocation and wage determination was under the dominant influence of non-market factors and there was no price equilibrating mechanism. In this sense, a labor market as an institution did not dominate.

The capitalist period begins with the economic transformation to a decentralized capitalist system in 1990, coincident with the breakup of Yugoslavia.⁴ This transformation implied two fundamental changes for wage inequality and wage differentials. The first was the acceptance of labor markets and capital markets, so that wage inequality and wage differentials could be viewed as legitimate labor market outcomes reflecting opportunity costs. The second was the abolition of the egalitarian ideology and its consequent regulation of incomes. With the transformation, the inherited institutional framework of the socialist period was formally declared unacceptable and was abolished.

The period after 1990 was in many respects much more stable than the previous. This may sound surprising given that the period started in 1990 with the three major shocks –economic transition, political independence, and the Homeland War– comparable to the largest shocks in Croatian history. The reason for the greater stability is that after 1990 there was a continuous development of one coherent institutional and regulatory system and after 1993 there was price and exchange rate stability. The new institutional framework was heavily influenced by two external actors. The first was the international financial community, most notably the World Bank and the IMF, with whom Croatia signed agreements in 1994 and in 2001. After 2003, when Croatia became an EU candidate country and started

⁴ Reliable monographs in English about the Croatian economy have been published by the World Bank, (2001, 2007) and other international institutions (UNDP, 2006; IMF, 2007). However, a detailed discussion on labor issues and especially wage inequality and wage determination is rarely present. Many of the points covered in the survey can be found in Franičević and Puljiz (2009) and Jakopec (2007)

membership negotiations, a concrete blueprint had to be implemented. This was the *acquis communautaire*, the common EU legislative framework.

New institutional arrangements for the labor market developed in the mid-1990s, following the economic transformation. In 1992, the first national collective contract was signed and a separate collective contract was signed for the public sector, which at that time covered over two-thirds of the economy. A tripartite body representing government, trade unions, and employers was established in 1994, marking the beginning of modern wage bargaining. From 1994 on, two-year collective contracts became the norm, with sector and 'house' contracts (firm level and mostly limited to large firms) derived from them. A new Labor Code was established in 1995, but it actually included provisions that maintained substantial labor market inflexibility, including advanced notice, severance pay, and preference for full-time employment. It was not until 2003 that the labor code was revised to include provisions that radically transformed labor markets: the state lost its monopoly on job mediation; the labor market was liberalized and unemployment benefits were reduced; and the first elements of employment and wage contract flexibility were introduced, reducing the costs of layoffs and the right to redundancy pay and unemployment benefits.

The collective bargaining contract in Croatia is particularly important for understanding wage inequality during this time period. The collective contract defines wage differentials for eight wage classes and 24 wage brackets, all linked to levels of professional attainment. Initially they were expressed as multiples of the basic wage of unskilled labor, but more recently they are in terms of the national average wage from the previous period. Because of the very large state and public sector, the multiples for state employees are especially important. The 1994 agreement was defined in terms of 24 multiples (coefficients) expressed relative to unskilled labor with a maximum range of 5.85:1. The 2001 revision expanded the relative range to 6.36:1. After 2000 there was an increasingly widespread

practice of 'managerial contracts' that regulate the payments of some employees by direct individual negotiations and personal contracts not subject to the collective agreement. As of 2009 there were 845 registered collective contracts at all levels and 800 'house' contracts, covering about 850.000 employees or nearly 50% of the workforce (Begić 2010, p:219).

In contrast to the socialist period when there was almost a continuum of stabilization policies, during the whole period after 1990 there was only a single attempt of an incomes policy, in October 1993, following the post-transformation hyperinflation of 1993.⁵ The incomes policy was part of a stabilization package that was targeted at regulating the increase of the wage bill in the non-privatized sector, at that time, by EBRD estimates, over 80% of the economy.⁶ The stabilization policy was a complete success and Croatia has enjoyed low inflation rates since, so that the wage bill regulation was abolished in 1994 and since then there has been no government wage policy.

3. Income Inequality in Croatia

The earliest works on inequality in Croatia using state of the art analysis are Bićanić (1984, 1988) and Milanović (1990). Bićanić (1984) is the only work in which inequality was measured for the constituent republics of Yugoslavia (and later independent states) and thus is the first source on Croatian inequality. After Croatia became independent, most early analyses of economic inequality were based on rough estimates and deductive reasoning due to a lack of data about the transformation generally and about inequality; for an early general survey, see Atkinson and Micklewright (1992) and for a Croatian perspective, see Bićanić (1992). This approach developed into the stylized facts of the transformation and was reflected in the most influential publications on the transformation (World Bank, 1996; EBRD Transition reports; Milanović, 1999). This view held that market liberalization,

⁵ The 1993 inflation rate was more than 1500%.

⁶ The policy was based on forward-looking indexing that envisaged a 24.9% increase in October and 4% increase in the subsequent two months and zero wage bill growth in the first half of 1994 (all corrected for changes in employment); see Anušić et al 1995, p.87 passim.

privatization, and institutional deficits leading to quasi-rents would lead to a major increase in inequality during the initial period of the transformation, after which inequality would stabilize or decrease under the influence of competitive pressures, institution building, and increased policy capacity.

Serious study of economic inequality in Croatia started after a World Bank initiative on economic inequality that eventually led to two World Bank reports (World Bank, 2000a, 2000b). Following that, Nestić, the main Croatian economist involved in the project, published the first post-1990 analytical work on Croatian income inequality from household income and consumption surveys conducted in 1988 and 1998 (Nestić, 2002).⁷ He reports that the Gini coefficient increased by about 8 percent over this time period (Nestić, 2002, p.607). In a later paper (Nestić, 2005), the period of analysis is extended from 1998 to 2002, resulting in slightly larger increase in inequality. He concludes that over this period inequality of income from paid employment increased and that wages made the greatest contribution to total inequality.

Leitner and Holzner (2008) compare Croatia to other Central and East European economies. They first establish that Croatia has relatively low levels of inequality and then show that the Croatian data fits into the pattern of Central European, Baltic and Eastern Balkan economies whereby higher union density and larger coverage of collective agreements leads to lower Gini values. They do not compute income inequality measures for Croatia nor consider time trends. The only paper that we have identified that uses some of the data that we use is Aksentijevic, Bogovic, and Jezic (2006), who report on income differences by educational and vocational attainment from 1996 through 2002. The authors do not, however, consider aggregate measures of inequality, nor examine a longer time trend that

⁷ The two surveys are not quite comparable. The data for 1988 comes from the last of the regular Five Year Household Income and Consumption Surveys conducted in Yugoslavia and its constituent republics, while the data for 1998 is from a World Bank-sponsored household consumption survey. The 1998 survey omitted around 10% of the territory and 5% of the population hardest hit by the Homeland war. Thus the 1998 data probably underestimates true inequality. Nestić claims this did not significantly influence the results (Nestić, 2002, pp. 98-100).

would permit comparisons before and after economic transformation. They also do not use the second wage series that we examine in our paper.

4. Data and Methods

Data. We use two data sources in our analysis of Croatian income inequality. The first data source is the distribution of fully-employed workers by net monthly wage intervals⁸ and the second is the distribution of average monthly net wages by level of education and vocational training. We refer to the former as our “income interval” data and the latter as our “attainment” data. Both series are based on a regular monthly survey of employers conducted by the Yugoslav Republican Statistical Office through 1990 and by the Republic of Croatia Central Bureau of Statistics since then.⁹ This survey includes 70% of persons in each industrial category of the National Classification of Economic Activities and it thus provides much fuller coverage of workers and their wages than other sources. Until 1995 the survey was conducted twice annually, (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 in March. In order to make our analysis consistent over time, we use only the March data throughout. The data cover all of Croatia except for the period from 1991 until 1995, when data from the temporarily occupied territories are omitted. Until 2004, all data were published only in paper form, so all pre-2004 data needed to be transferred to electronic form. To our knowledge, the income interval data have not been used in any analyses of income inequality in Croatia and the attainment data have been used only in the 1998-2004 analysis of Aksentijevic, Bogovic, and Jezic (2006).

⁸ Fully employed workers work at least 182 hours a month. Partially employed workers are omitted. The survey covers firms with at least 15 employees.

⁹ During the Yugoslavia period, data was published separately for the constituent republics, including Croatia. The survey was the RAD-1 questionnaire completed by firms in the census until 1989 and the RAD-1G questionnaire since 1996. Survey results were published in the Statistical Yearbook of the Republic of Croatia during the whole period with the exception of 1988 to 1996 when it was published only in specialized statistical announcements.

The income interval data are available annually beginning in 1973, with the exception of 1980 and 1981. The attainment data series is available approximately every other year beginning in 1970 through 1988, and then annually from 1990 to 2008. For the 1989-1995 period, we have wage data for each education and vocational training group, but the corresponding employment shares data needed to compute aggregate inequality measures are unavailable. This gap coincides with the breakup of Yugoslavia (1990) and the Homeland war (1991-1995). Educational and vocational attainment are classified according to the ILO definitions and include four education categories (University Degree,¹⁰ Non-University Degree, Secondary, and Basic) and four vocational levels (Highly-Skilled, Skilled, Semi-skilled, and Unskilled).

It appears that the two wage series are substantially overlapping in terms of population coverage. The wage data by attainment are based on wage reports for 1.0-1.5 million workers through 1988 and then 0.9-1.1 million workers thereafter. Sample size for the income interval data is not published in most years, but when it is available, the sample is about 90-95% of the attainment sample. We examine further below the similarity between comparable aspects of the two data sets.

The monetary denomination changed several times during the analyzed period due to the cumulative effects of inflation, including the hyperinflations of 1989 and 1993. In January 1990 the Yugoslav dinar (YUD) was replaced by the Convertible dinar at a rate of 10,000 YUD = 1 Convertible dinar. By the end of 1991, the official currency in Croatia was the Croatian dinar (HRD) with 1 Convertible dinar equal to 1 HRD. As a consequence of high inflation, the Croatian kuna (HRK) was introduced in May 1994, with 1,000 HRD equal to 1 HRK.

Our data sets have some weaknesses that limit what we can do. Microdata, which would enable us to compute ideal measures of overall inequality, do not exist for the early period. The data series do

¹⁰ This category includes Doctoral, Masters and Bachelors' degrees.

not include wages and employment for workers in crafts, trades and “freelances,” the military, or for independent farmers. As noted above, the income interval data are for full-time workers only, a restriction that likely reduces measured inequality. The intervals themselves, especially the top interval, were not always adjusted fully for changes in nominal wages. As a consequence, we are not able to estimate inequality caused by high earners as consistently across the time periods as well as we would like. In addition, we do not know the average income in each income interval and thus must make some assumption about the distribution within intervals. For the closed intervals, we assume that the interval mean equals the midpoint of the interval, an assumption consistent with many underlying distributions.¹¹ For the open top interval, we assume that the average income is twice the minimum, although we explore allowing the average income to vary with the population density of the top bracket.¹² In the educational/vocational training attainment data, we do know the mean for each group, but the groups are obviously from potentially overlapping distributions and we have no information about the range of incomes for each group.

Methods. We examine a variety of measures of wage inequality and dispersion. We use the attainment data to calculate group earnings differentials and a Gini coefficient. We use the income interval data to compute a Gini coefficient and the 90/10 income ratio, a measure that complements the Gini.

Given the nature of our data, we use the appropriate grouped data formulas to compute the Gini coefficient. For the interval data, we compute both lower and upper bounds since we have no information about the distribution of incomes within groups. The Gini upper bound value assumes maximum inequality within every bracket (i.e., all income recipients have either the maximum or

¹¹ We examine the sensitivity of our results to this assumption.

¹² The percent of workers in that top bracket varies from as little as .5% to as much as 8-10% (1985 and 1989). We explore allowing the average income to vary with the population density of the top bracket and report those results below.

minimum income in the bracket), while the Gini lower bound values assume no inequality within a wage bracket (all income recipients have income equal to the mean of the income bracket). For the attainment data, the Gini corresponds to the lower bound measure. Equations (1) and (2) below for the two Gini measures are taken from Cowell (1995, pp.111-115 and p.147).

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

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

In equations (1) and (2), \bar{y} is average population income, μ_i is average income in income class i , n is population size, and a_i is the lower boundary income for income class i . λ_i , which is used to calculate the upper bound Gini, is the fraction of individuals who, for a given μ_i , must have income equal to a_i , with the remaining $(1-\lambda)$ fraction having income equal to a_{i+1} , the maximum income in the interval.¹³ In our computation of (2), we assume that $\mu_i = .5(a_i + a_{i+1})$, so that $\lambda = n_i/2$ (i. e., the average income equals the interval midpoint and half of the individuals have the minimum and maximum income in the bracket).

The Gini coefficients calculated from the two data sets represent different aspects of overall inequality, a difference that is revealing. The lower-bound Gini based on the attainment data reflects only those income differences linked to average incomes and population shares by level of education and vocational training. It tells us what would have happened to inequality if all workers with a given level of education or vocational training had the same income, a difference often referred to as *between-group inequality*. The corresponding Gini based on the interval data reflects the actual distribution of individual incomes, including both the between-group differences and any additional

¹³ $\lambda_i = (a_{i+1} - \mu_i) / (a_{i+1} - a_i)$

income differences that arise among individuals within skill groups. These latter income differences are often referred to as *within-group inequality*. As a result, the difference between these two measures is a measure of the importance of within-group differences, that is, wage payments based on individual characteristics and/or productivity, rather than average group characteristics.

The widening of both between-group and within-group earnings differences are two of the established facts of rising inequality in the US over the past few decades (Katz and Murphy, 1993; Juhn, Murphy, and Pierce, 1993; Katz and Autor, 1999). In the US, rising between-group income differences across educational groups is attributed either to skill-biased technological change and/or to weakening institutional constraints (Card and DiNardo, 2002; Goldin and Katz, 2008). Rising within-group earnings differences, often referred to as residual inequality, are typically attributed to unobserved individual productivity differences; by some accounts, they account for the lion's share of rising inequality in the US over the 1965-1989 time period (Juhn, Murphy, and Pierce, 1993).

By comparing inequality from the attainment data to that based on the full distribution of individual income, we can get some insight into the possible role of these within-group earnings differences in the pre- and post-transformation Croatian economy. We speculate that the economic transformation might well have increased the relative importance of individual productivity relative to average group productivity if it provided an economic environment with enhanced profit motives and if decentralized labor markets and wage-setting allowed wages to be more closely aligned with individual marginal products. We think both of these conditions likely held to some degree in post-transformation Croatia. If so, we would expect to see a greater increase, post-transformation, in inequality measured with the income interval data than in inequality measured with the attainment data. Because Croatia was widely considered a transformation laggard, it is possible that these effects could appear with some time lag.

5. Wage Inequality and Wage Differentials in Croatia, 1970-2008

Before turning to our analysis, we first consider the comparability of our two data sources. Average income is provided directly in the attainment series; in the income interval data, we compute it from the average income and population shares in each bracket. The two average wage series are, in fact, reasonably close to one another in most years, which is reassuring. We have an average wage for both series in 25 years from 1974 to 2008. From 1974 to 1985 (five observations), the average wage in the attainment data is about 10-12 percent higher than the corresponding average in the interval data. From 1988 to 1993 (five observations), the two series diverge substantially, with the attainment average wage 30-40 percent higher in 1988 and 1990 and twice as high in 1992 and 1993. These are the tumultuous years of hyperinflation, political separation, and war; the sample is restricted in those years, as well. But thereafter, the two series track extremely closely, never differing by more than two or three percentage points. Where feasible, we focus primarily on the 1970-88 and 1994-2008 periods, where the two series are more closely aligned.

The average wage in the interval data could be too low if average income in an interval is greater than the midpoint or if average income in the open top interval is greater than twice its lower bound (our assumptions). We examine the sensitivity of the mean to these assumptions by varying both: we let the average interval income equal two-thirds of the range and we let the average income of the top interval vary positively with the population density in the interval, instead of assuming a constant ratio.

Increasing the interval mean from the midpoint to two-thirds increases average income by about 4-6 percent, not enough to reconcile the series when they differ and moving them further apart in the years since 1994. To test the open interval assumption, we set average income in the top interval equal to $1 + (\delta_t/\mu)^5 \times Y_{\min}$ where δ_t is the percent of the population in the top interval in year t , μ is the

corresponding average percent over the entire time period, and Y_{\min} is the lower bracket interval. The proportion in the top interval varies from about one percent to over eight percent, with an average of 3.2%. With this adjustment, the mean in the interval will equal twice the interval minimum when the proportion equals the mean value, 2.4 times the minimum if the proportion in the interval was twice the mean, and about 1.7 times the mean income if the proportion was half of the mean proportion. While this adjustment is necessarily arbitrary, it provides a useful rough measure of the likely effect of adjustments like this. It turns out that this also has a relatively modest effect on the mean monthly wage. In years when the proportion in the interval is low, the adjustment has a negligible impact on the overall mean, precisely because the fraction of the total population whose income is being adjusted is so small. The impact is naturally larger in the positive direction when the interval fraction is larger, but even here, the maximum impact is less than eight percent and in only four years is the increase as large as four percent. We conclude, therefore, that reasonable changes in our assumptions would probably have a second-order effect on the changes that we report below.

Wage Differentials. Figure 1 depicts the time path of wages for each of the eight educational and vocational training groups relative to the average wage in that year. The top line shows that workers with a university degree earned about twice the economy-wide average in 1970, but lost ground sharply in the next few years and then gradually and somewhat episodically ever since. Since 2000, their relative income has been stable at about 60% above the overall average and, indeed, it was not much different in 2008 than 15 years earlier, at the beginning of the capitalist period. The other two groups initially well above the average—those with a non-university college degree and those with high skill vocational training—also experienced a decrease in their relative earnings. The time path of wages for these two groups is quite similar to that of the college-educated workers, with much of the decline in the first years and little or no change since the mid-1990s. By the end of the time period, wages for workers with non-university degrees were 20% above the economy-wide average, while average wages

for high skilled workers were about 7% above the average, just about half of the wage premium they received in the early to mid 1970s. Average wages for workers with a secondary education level fell from 12% above the average to nine percent below the average; they are the only group that crosses from above to below the average. The groups with average wages below the 1970 average all experienced a decline in their relative wage, so they clearly contributed to growing wage inequality. The decline is least, though, for the two groups with the lowest 1970 wages – semi-skilled and unskilled workers.

Several time patterns are evident in Figure 1. First, wage differentials in 1970 are the highest observed over the entire time period. In 1970, group average wages ranged from 67% to 200% of the overall average, while in both 1985 and 1994, the range of average wages was from 70% to 155%. In 2008, the range was from 62% to 158% of the mean. Second, most of the decline in average relative earnings for the three highest wage groups occurred in the socialist period, especially through the mid-1970s. The relative earnings of the top three groups decline almost in parallel over these years, suggesting some kind of common explanation. Almost all of the change in relative earnings over the entire period occurs by the mid-1980s. Third, wage profiles have been virtually parallel since about the late 1990s, so that relative wages have been essentially unchanged. This might be an indication that labor markets are not particularly flexible, that relative supply and demand has been unchanged, or that something other than group average wages has changed.

While the common perception is that wage differentials were artificially compressed during socialism and that the liberalization of labor markets in the beginning of the transformation should lead to a significant decompression of wage differentials, the data in Figure 1 do not fully support this. The sharp decline in wage premiums for the three most-highly paid groups between 1970 and 1974 may well have reflected a deliberate policy of wage compression, but the differentials do not expand much after

the transformation. Visually, the figure suggests a probable decline in overall between-group inequality between 1970 and the early to mid-1980s and a slight increase thereafter, with most of the increase occurring between 1994 and 2000. But because the various groups had different relative changes and because average wages decline both for groups originally above the mean (inequality reducing) and below the mean (inequality increasing), it is not possible to draw a clear conclusion about the direction of overall inequality.

Wage Inequality. We can use the average wages for each group from Figure 1 to compute the lower-bound Gini coefficient, which measures the inequality arising from changing relative wages over this time period.¹⁴ The Gini is a useful summary measure of the trends shown in Figure 1 that accounts for all of the changes and for the changes in relative population weights. Visual impressions drawn from Figure 1 implicitly assume constant group shares over time, but that may not be true. Indeed, it is not: the proportion with a college degree increased from 5-6% in the early years to more than 15% in the 2000s, while the proportion unskilled decreased from 25% to about 8%.

We show the time trend for the Gini based on group income differences in Figure 2. The overall level is quite low, but, as already noted, this measure captures just one portion, albeit an interesting one, of overall inequality. The figure shows that overall between-group inequality declined sharply between 1970 and 1974 and then again, following a small increase, from 1978 through 1985. That year is the low point over the entire time period. Our data points are thinner over the next decade, but inequality remained about the same through 1996, rising just .005. Then inequality between skill groups increased steadily through 2000, rising back to its level in the early 1970s, though not quite back to its 1970 value. Since then, between-group inequality on the basis of education and vocational training has stabilized at this level, with barely any change at all since 2000. This last observation is consistent with

¹⁴ We cannot compute the upper bound here because the groups are overlapping.

the parallel income profiles post-2000 in Figure 1. The actual changes in the Lorenz curve between 1996 and 2000, a time period that covers most of the increase in the Gini coefficient, are quite modest. In 1996, the bottom 75% of workers had 66% of the income (88% of their population share), while in 2000, the bottom 74% had 62.3% of the income, a share equivalent to 84% of their population share. Similarly, the top 12.3% of workers (here, college-educated workers) had a 19.5% income in 1996, compared to 14.1% with a 23.6% income share in 2000. On the whole, income inequality in this dimension has moved in a relatively narrow band over the 38 years covered by our data.

The income interval data provide a more comprehensive measure of inequality and we therefore expect measured inequality to be higher with this data. Figure 3 shows the inequality trend in individual incomes from this data for 1973-2008. We show two measures derived from that data – the lower-bound Gini and the 90/10 earnings ratio. The 90/10 ratio is inferred from the grouped income distributions by linear interpolation; since we do not know the within-group distribution of income, it is approximate, but the trend is sufficiently clear that the approximation is certainly acceptable. We do not present the upper-bound Gini, because it is quite similar in trend to the lower-bound Gini and differs by no more than two to three percent in most years. The lower-bound measure on the interval data is also more directly comparable to the lower-bound Gini computed using the attainment data.

Unlike the previous analysis, here we see in both measures a steady secular increase in overall wage inequality. Looking first at the 90/10 ratio (right scale), we see a remarkably constant ratio of about 2.5 from 1970 to 1988, nearly the full Socialist period. Then the ratio jumps sharply six years in a row (through the period of war, hyperinflation, and the initial economic transformation) to a value of 3.59.¹⁵ The trend is a bit noisy thereafter, but that probably reflects the interpolation procedures. Since 2000, the ratio has been consistently in the 3.3-3.4 range with the exception of a single dip in 2000. The

¹⁵ This is also the time period where our two wage measures differ the most.

Gini also shows this increase in inequality with a strikingly similar time pattern. The income interval Gini coefficient ranges from 0.21 to .26 through the mid-1980s, then increases, with an erratic pattern, to the .30-.35 range. There is little doubt here that the overall trend in incomes shown here is toward greater inequality, despite the fact that average income inequality by educational and vocational attainment has decreased relative to 1970 and shows much less of a secular increase thereafter.

Figure 3 also shows one-year spikes in the Gini coefficient in 1989, 1993, and 1998, with declines following each spike. The 90/10 ratio also shows the same increases but without the decline in inequality following the 1989 spike. This time period includes the chaotic period linked to the decomposition of Yugoslavia, the imposition of new transformation policies that made a complete break with the socialist regime, the Homeland war, and hyperinflation. The falling inequality observed between 1993 and 1995 coincides with the implementation of a successful anti-inflation policy, which included frozen wage differentials and strict control over the firm wage fund. The spike in 1998 follows a period when wage differentials were deregulated and the economy started postwar renewal. In 1999, a recession year with negative economic growth, inequality fell back to the pre-spike trend. The period from 2000 to 2006 appears to be a time of small but steady increases in wage inequality. In January 2000 a new government came into power and the era of authoritarian dictatorship ended. Not less important, the country stopped being an international pariah and an Accession and Stability Pact was signed with the EU in 2001, leading to the start of EU membership negotiations in 2004 and NATO membership in 2005.

Interpretation. A comparison of the inequality trends derived from the attainment data and the income interval data is quite revealing about what may have been going on in the Croatian labor market, especially before and after the economic transformation. A first glimpse is in Figures 4 and 5, which show the Lorenz curves derived from both the attainment and interval data in 1976 (Figure 4) and 2008

(Figure 5). The attainment data reveals the effect exclusively of the attainment group average wage differences, while the interval data includes all components of wage differences. 1976 is a representative early year; the attainment Gini equals 0.136 and the interval Gini equals 0.230. The area between the two Lorenz curves representing income inequality beyond that generated by average group earnings differences is relatively modest. The horizontal difference between the two curves—the difference in the proportion of the population with a given cumulative income share—is about 6-8 percentage points at most spots along the curves. For example, approximately 60% of total wages accrue to about 68% of the population in the attainment data and about 74% of the population in the income interval data. By 2008, the attainment Gini has increased modestly to 0.154, while the income interval Gini has increased more substantially to 0.324. As can be seen in Figure 5, the area between the two curves is substantially greater. For example, forty percent of the population now has 20% of cumulative wages (interval data) compared to 26% of the population with 18% of cumulative wages (attainment data). The comparison of Figures 4 and 5 thus suggests a far bigger role for individual wage differences relative to group average wages in 2008 than 1976.

In Figure 6, we present the two Gini measures together over the entire period to facilitate a direct comparison of the trends. As suggested in the pair of Lorenz curves, Figure 6 shows a growing difference between the two inequality measures between the Socialist and free market periods. In the 1970s and early 1980s, the difference between the two measures is about 0.08-0.10 and the two mostly move in tandem. Over this time period, the attainment Gini is about 60% of the value of the interval Gini, which means that the remaining 40% of overall inequality is related to within-group differences. The difference between the two measures jumps sharply in the mid-1980s and thereafter to about 0.14-0.16. The attainment Gini is now about half the income interval Gini, implying an increase in the portion of inequality linked to pay differences within the groups.

Indeed, between 1988, the last common year of observation for both data series in the Socialist era, and 2008, the attainment Gini increased .018, while the interval Gini increased .075. This tells us that changing between-group inequality accounted for only about 25% of the increase in overall inequality over these years, with the remaining 75% attributable to growing within-group income differences. This trend almost certainly indicates that the relative importance of pay by nominal characteristics and by average productivity (i.e., group earnings differences) was declining and that pay linked to individual productivity was on the rise, a change roughly consistent with a move to a market-based economy.

Table 1 summarizes these trends across three time periods: the Socialist period; an interim period that covers the turbulent years of independence, war, hyperinflation and early transformation; and the more mature capitalist period. Because we want to compare the trends for the two measures, we focus on the period from 1973 to 2008, using the average of 1972 and 1974 to create a 1973 Gini value for the attainment data. We use 1989-1995 to define the interim period¹⁶ and the years before and after for the Socialist and mature capitalist periods. The table shows beginning, end, and average values for the two Gini measures and the 90/10 ratio, and also the proportion of inequality attributed to within-group income differences.

During the Socialist years, the average Gini from the income interval data is 0.237, the average 90/10 ratio is 2.56, and the average Gini from the attainment data is 0.135. This means that 43% of the inequality ($.102/.237$) is related to the difference in average wages within the education and vocational attainment groups. During the interim period, the interval Gini and 90/10 both increase substantially; not shown in the table is the substantial variation around the mean values. Because we cannot compute the attainment Gini for those years, we cannot determine the proportion of total inequality

¹⁶ Recall that this is also the time period when the income interval data matched poorly with the attainment data and where we cannot compute a Gini coefficient from the attainment data because employment shares are missing.

linked to wage differences between and within groups. In the capitalist period, the average Gini with the income interval data is 0.308, up 0.031 from the interim period average and up more than 0.07 from the Socialist period average; the capitalist period ending value is up 0.079 from the end of the Socialist period. The average 90/10 ratio is up just a very small amount over the interim period, although the period ending value is up much more. Finally, the proportion of inequality within groups is up substantially from the Socialist period. That proportion is now about 50% (.155/.308) for the whole capitalist period.

To examine these trends more formally, we estimated very simple time trends of inequality in the Socialist and post-war capitalist periods, 1973-88 and 1996-2008, respectively. We estimate the time trend for overall inequality (the interval Gini) and for within-group inequality (the difference between the interval and attainment Ginis). We use a parsimonious specification with just a linear trend and a dummy variable for two outlier years (1985 in the Socialist period and 1998 in the capitalist period) that would otherwise distort the broad trend. Our results are summarized in Table 2.

For the Socialist period, we have 14 observations for overall inequality, but only six years for within-group inequality because the attainment data were collected every other year and the interval data were not collected in 1980 and 1981. The years in common are 1974, 1976, 1978, 1983, 1985, and 1988. The smaller sample appears to be representative of the full sample: the mean and standard deviation of the interval Gini is the same in both samples (.240 and .019, respectively). As shown in row (1), overall inequality rose at an average annual rate of 0.0011; the estimate is not statistically significant ($t=0.8$), due to the small sample.¹⁷ Within-group inequality rose more rapidly at a rate of .0016 per year; this effect is statistically significant at the five percent level. After the economic transformation, we find that both inequality time trends increased. Overall inequality rose at a 0.0044 annual rate and

¹⁷ The same model applied to the full 14 years yields a time trend estimate of .0015 ($t=1.7$).

within-group inequality rose at an average rate of 0.0033 annually. These estimates are consistent with our earlier observation that the trend of inequality increased after the transformation and also that three-quarters of the increase in overall inequality during this time period reflected changes in within-group inequality.

6. Summary and Conclusions

In this paper, we have used the available Croatian data on income by income intervals and by educational and vocational attainment to measure wage dispersion and wage inequality in Croatia from the early 1970s through 2008. Using the two data series together reveals changing aspects of inequality, namely, the differences in inequality between educational and vocational attainment groups and within them. We also examined differences in inequality across industrial sectors, focusing on industries that experienced quite different economic shocks during the transformation from socialism to capitalism.

Our analysis is necessarily constrained by the unavailability of microdata that would enable us to go beyond the income interval data and avoid the need to make assumptions about the underlying distribution. Access to microdata, at least in the current period, would improve our estimates of average income and also of the inequality contributed by the top income bracket. In addition, the data series we use have time gaps and the samples are not fully inclusive of all wage earners. Still, the two long consistent data series we use are an improvement over the data used in other analyses of Croatian income inequality.

The two data series, used in conjunction with one another, tell a quite consistent story about the development of labor markets in Croatia. The period we examine is a tumultuous one in Croatian history, including, as it does, not only the transformation of the economy, but also the creation of sovereign Croatia, the Homeland War, multiple bouts of hyperinflation, and the initial integration into Europe. We have documented a general increase in overall inequality, with a rising trend in the post-

transformation capitalist period. The Gini coefficient based on income interval data rose from an average value of about 0.23 in the Socialist period to 0.31 in the capitalist period, with a value in 2008 of 0.333. The increase in overall inequality occurred in spite of a flat trend in wage differences among groups classified by educational and vocational attainment; the Gini coefficient based on wage differences by attainment level rose very slightly over the entire time period. Taken together, these two inequality trends point to growing inequality among individuals within educational and vocational groups, a finding confirmed in our simple time-series analysis. In the capitalist period, we estimate that 75% of the increase in inequality reflects that source. We interpret that finding as broadly consistent with the rising returns to skill reported in most Western economies and with a greater emphasis on individual productivity rather than group characteristics.

We are not drawing normative conclusions from our analysis of the changing nature of wage inequality in Croatia. By most measures, aggregate inequality in Croatia remains relatively low. Wage differentials that reflect productivity levels are an important allocative feature of a market economy. Our analysis does not, of course, allow us to couple productivity with wage levels. Continued monitoring of labor market outcomes in Croatia is advisable. Further analysis with microdata would be another valuable research contribution.

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Table 1: Wage Inequality in Socialist, Interim, and Capitalist Periods, Croatia, 1973-2008

| | Gini Coefficient, Income Interval Data | 90/10 Ratio, Income Interval Data | Gini Coefficient, Attainment Data ¹ | Within-Group Inequality (% of Total) |
|--|--|-----------------------------------|--|--------------------------------------|
| SOCIALIST PERIOD (1973-1988) | | | | |
| Initial | 0.210 | 2.55 | 0.151 | 28.2% |
| End of period | 0.254 | 2.70 | 0.136 | 46.5% |
| Period Average | 0.237 | 2.56 | 0.135 | 42.9% |
| INDEPENDENCE, WAR, HYPERINFLATION (1989-1995) | | | | |
| Initial | 0.296 | 2.93 | NA | NA |
| End of period | 0.242 | 2.92 | NA | NA |
| Period Average | 0.277 | 3.20 | NA | NA |
| CAPITALIST PERIOD (1996-2008) | | | | |
| Initial | 0.262 | 2.89 | 0.132 | 49.7% |
| End of period | 0.333 | 3.38 | 0.154 | 53.8% |
| Period Average | 0.308 | 3.26 | 0.153 | 50.3% |

¹ Initial value for Socialist Period is average of 1972 and 1974 values

Table 2. Time Trend of Inequality in Croatia by Type and Time Period, 1973-2008

| | Time Trend | Sample Size | R-squared (adj.) |
|--|------------|-------------|------------------|
| Socialist Period (1973-1988, Common Years Only¹) | | | |
| Total Inequality | 0.0011 | 6 | 0.467 |
| Within-Group Inequality | 0.0016** | 6 | 0.902 |
| Post-War Capitalist Period (1996-2008)² | | | |
| Total Inequality | 0.0044** | 13 | 0.892 |
| Within-Group Inequality | 0.0033** | 13 | 0.936 |

** = statistically significant at the 5% level

¹ Model also includes a dummy variable indicator for 1985.

² Model also includes a dummy variable indicator for 1998.

Figure 1. Average Relative Wage Income by Educational Attainment and Vocational Skill Level, Croatia, 1970-2008

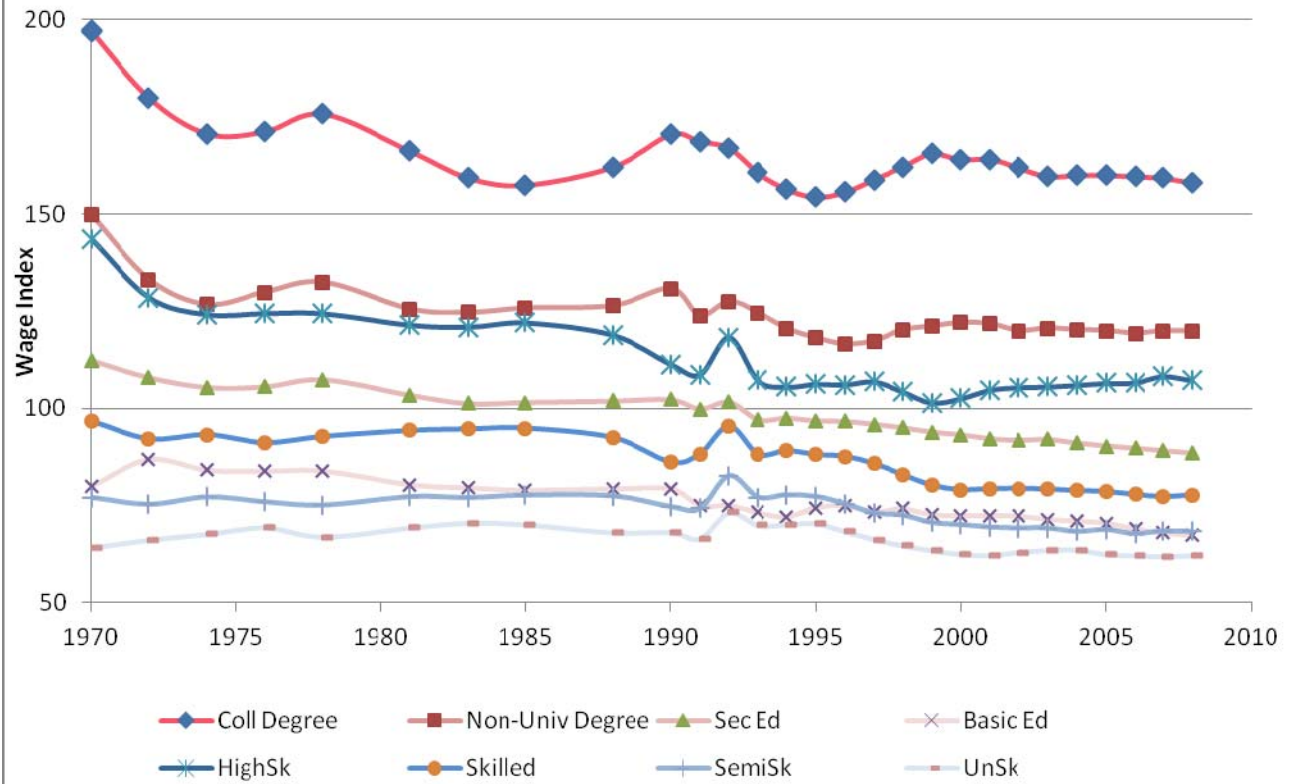


Figure 2. Gini Coefficient for Educational and Vocational Attainment Groups, Croatia, 1970-2008

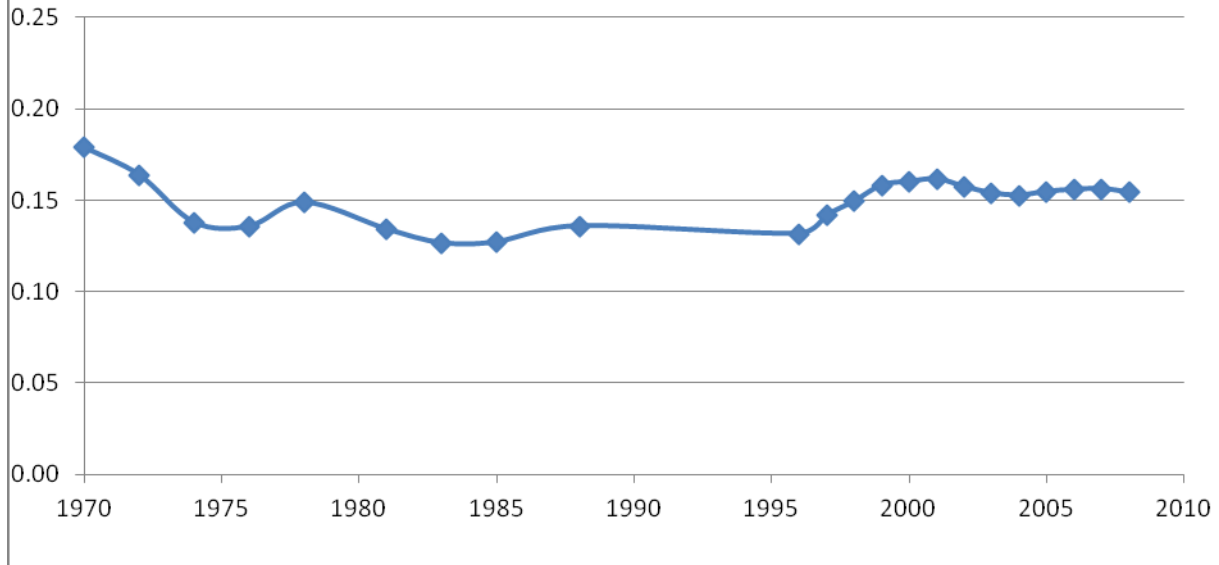


Figure 3. Gini Coefficient and 90/10 Income Ratio, Income Interval Data, Croatia, 1973-2008

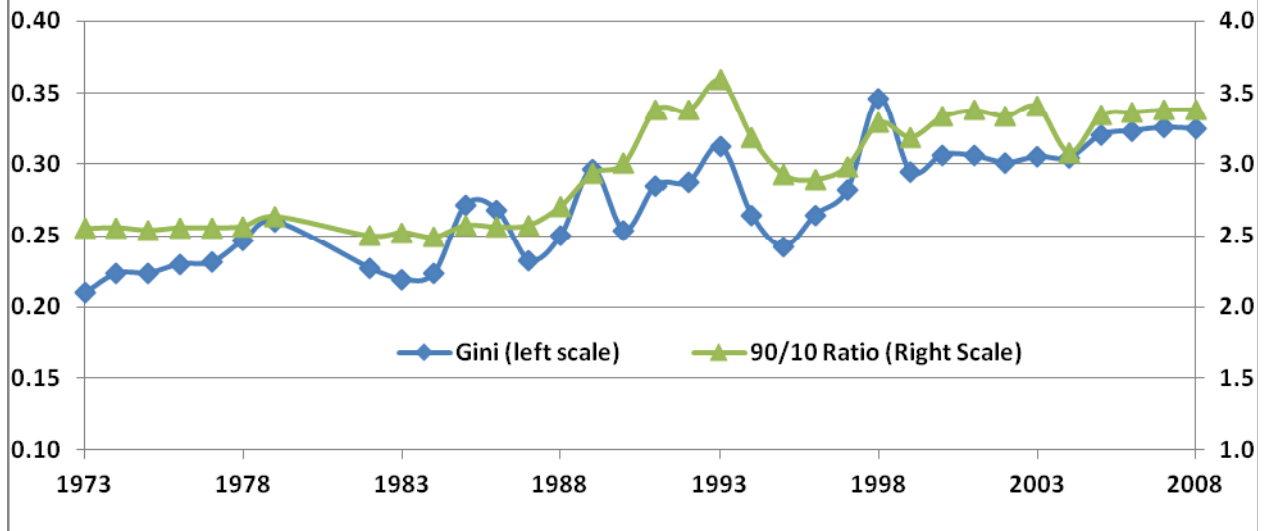


Figure 4. Lorenz Curves, Croatia, 1976, Interval and Attainment Data

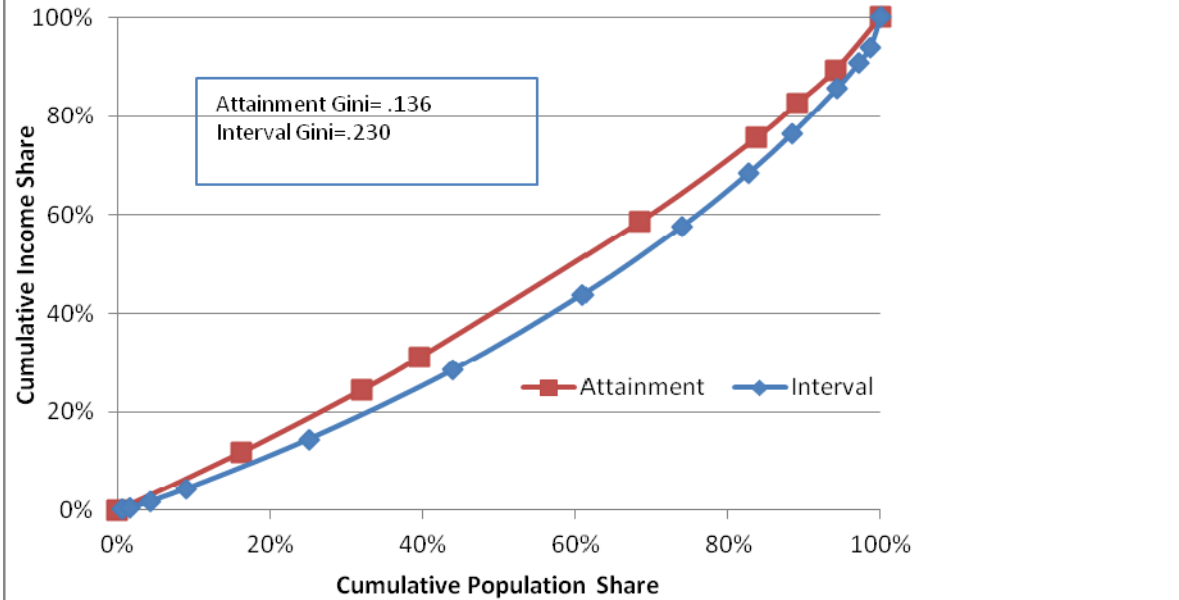


Figure 5. Lorenz Curves, Croatia, 2008, Interval and Attainment Data

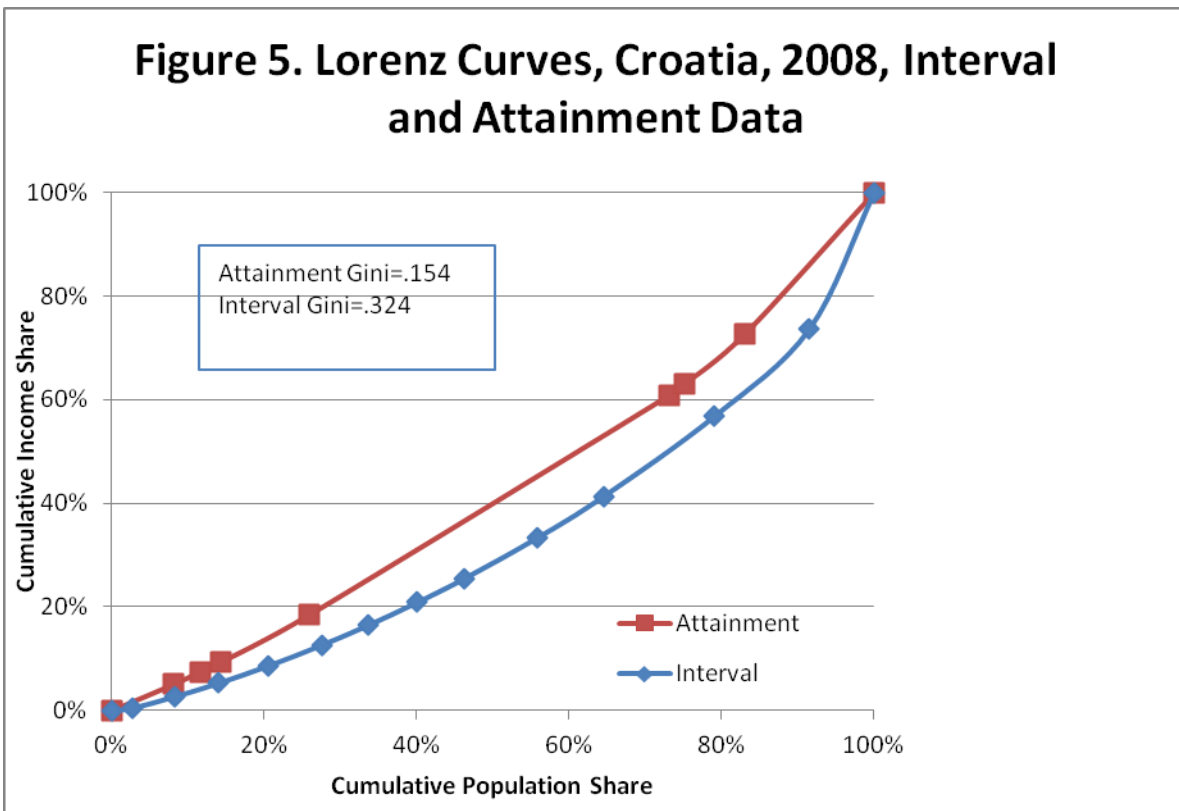


Figure 6. Alternative Measures of Income Inequality, Croatia, 1970-2008

