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CROATIAN WAGE INEQUALITY AND WAGE DIFFERENTIALS, 1970-2008: MEASUREMENT AND DETERMINANTS

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1. Introduction

The primary goal of this project is to offer a reliable measurement of medium-term changes of wage inequality and wage differentials in Croatia from 1970 (when the first data was collected) to 2008 (the most recent data available at the time of writing). This period covers, of course, a tumultuous time for Croatia and the Croatian economy: the fall of socialism, hyperinflation, and the Homeland war. We focus on the two most often used inequality measures, the Gini coefficient and the Theil index, using data on wage differences by level of education and vocational training and also by income intervals. We also examine differences over time in inequality for key industrial sectors that were arguable affected quite differently by the many shocks that the Croatian economy experienced over this time period.

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 rich and dramatic institutional changes provide an opportunity to explain the inequality trends we find. 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.

We find that average wage differentials by education and vocational training narrowed slightly from 1970 through about the mid-1980s, increased through the mid-1990s and then stabilized. Our analyses of inequality by income groups shows a similar pattern, with the Gini coefficient based on income interval data rising from the .20-25 range between 1970 and the mid-1980s to .30 and over since the late 1990s. In both measures, inequality rose subsequent to the economic transition; overall inequality was higher in 2008 than in 1970 for the income interval data, but still lower, despite the increase in the 2000s, for the educational/vocational attainment data. Changes in inequality did vary considerably across industrial sectors. We do not, however, find evidence that industries that transitioned from state-controlled to market-based experienced the largest

increase in inequality. Instead, the biggest change was in the financial sector, where foreign direct investment was substantial.

2. Labor Markets in Croatia - Background and Institutional Details

In this section, we review the institutional context in which Croatian labor markets operated during this period. From 1970 to 2008, Croatia and Croatian labor markets were exposed to an almost continuous series of shocks, among which institutional shocks were the most important. These institutional shocks ranged from social engineering of the most fundamental kind to demand management stabilization policies. Arguably the greatest changes were during the period from 1989 to 1991 when the three largest changes in Croatia's recent history coincided. First, of course, was the regime change from socialism to capitalism. Second, the internal market and area of arbitrage contracted as Yugoslavia decomposed and sovereign Croatia was established, shrinking the internal market from 22 million inhabitants to just over 4 million. Finally, the Homeland War started in late summer 1990 and continued through the summer of 1995. In addition to these fundamental changes, Croatia also experienced numerous smaller shocks like reforms (especially of the socialist 'project' during the early 1970s and mid-1980s), external shocks (the oil shock and foreign debt crises in the early 1980s), and numerous policy changes linked to stabilization policies in the early 1970s, the early and late 1980s, and the early 1990s. These stabilization policies regularly concentrated on external liquidity and curbing inflationary pressures; the inflation rate three times came to hyperinflationary proportions, in 1980, in 1990 and in 1993 and were usually followed by institutional reform.

Of course, all these changes had a great influence on the employment of labour, on labour allocation and labour outcomes, especially wage inequality and wage differentials. Indeed, as Section 4 shows, it is striking to what extent the latter two reflect changes in the institutional framework and macroeconomic policy objectives. As a result, the changes in wage inequality and wage differentials can quite convincingly be described by the sequence of shocks. This close relationship of wage inequality and wage differentials with the continuum of shocks provides the best justification for the reliance on the narrative approach being adopted.

2.1 WAGE DETERMINATION DURING THE SOCIALIST PERIOD (1970-1990)[1]

The almost 40 year period under consideration can be divided into two almost equal sub-periods – the socialist period that lasted through 1989 and the capitalist period that followed. In the socialist period, labour had a special position by virtue of the socialist ideology being applied. On the most general level, social justice was based on labour contributions ('distribution according to labour and results of labour') and labour was not accepted as a commodity. Therefore, labour markets could not be institutionally recognized. However, in Yugoslavia, which Croatia was an integral part of and with whom it shared an institutional and policy framework, this socialist ideology included two important further steps. First, the practice of workers' self management, introduced in 1952, implied substantial firm independence and market exchange. All business decisions were taken independently by worker-appointed managers or by workers councils directly. Through a sequence of institutional reforms, the scope of their decisions expanded over time at the expense of state regulation. But because socialist ideology limited markets, open, institutionalized and regulated markets existed only for final products, but not for factors of production. As a result capital and labour markets were unregulated and often covert informal markets. Second, directive/central planning was abolished in practice in 1949 and institutionally in 1951.[2] 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 institutional framework that translated these general principles into an operative economic system was developed over time through 'social engineering,' which took the form of a sequence of reforms. From 1970 to 1989, the institutional framework was developed as a backlash of the pro-market reforms of 1965 through a set of constitutional amendments in 1971 (Miljevic et al. 1971 and Labcevski, 1972), which were then consistently set out in a new constitution in 1974 and in an especially important Law on Associated Labour in 1976 (Žuric, 1979). This institutional framework was reformed following the

[1] A voluminous literature on Yugoslav economic development exists. Some English sources for the material covered in this section can be found in Lydall (1984), Schrenk (1979), Cicin-Šain and Ellis (1986), Mencinger (2000) and Lang et al (1982), various issues of the semi-official quarterly journal *Yugoslav Survey* 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* (the 'red book').

[2] Central planning of the allocation of resources ended in 1951 and of investments in 1972. As a practical matter, the League of Communists, as the communist party was formally called after 1956, often acted as the final overt or covert decision-making body through a process known as 'democratic centralism.'

report of the in 1982 Kreigher commission, which argued in favor of wide-ranging pro-market reforms (Lazovic, 1983). In 1983 the reforms included decentralization of wage decisions and in 1984 an accounting reform whereby personal incomes were last in line to be paid, so that all other contractual obligations had priority. However, this pro-market trend was backtracked after the completion of the Pašic commission report, which argued for a return to 'primary socialist goals' (i.e. fewer markets). It reaffirmed the 'associated labour paradigm' and the substitution of markets by self-managing agreements, making for an incoherent economic system (Mencinger, 2006). The system of associated labour and socialist self-management was finally transformed into a mixed ownership market economy in 1989 (Markovic, 1990). The final institutional remains of the system were formally eliminated in Croatia in the Christmas constitution in 1991 (Ustav Republike Hrvatske 1990). Looking at the 1970-1990 sub-period as a whole, institutional uncertainty is obvious, with changes never coherent and not always going in the same direction.

The Yugoslav economic system, as it was defined in the institutional framework, had a built-in flaw with major repercussions for labour outcomes. This flaw concerns the pricing of capital and was well known as early as the 1950s[3]. After the reforms of 1965, firms paid no price for the capital resources they used; prior to that, interest was paid on the firm's capital to a centralized federal fund, but this fund was abolished in 1965 for mistaken economic reasons and justified political reasons. This meant that once interest on loans and taxes were paid, self-managed firms were free to distribute net income and could channel and distribute capital income into personal incomes. The consequences of this were far-reaching and led to 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 higher capital income. The latter was possible since enterprises nominally had complete autonomy in determining the 'wage fund' and wage differentials'.

Labour outcomes, distributional policies and wage policies during the whole socialist period largely concentrated on neutralizing the disastrous effects and consequences of this flaw. This was also the main incentive for and preoccupation of distributional reforms, regulations and policies. The substance of these measures was to 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

[3] An early example is Ward's 'Illyrian firm' from the mid-1950s (Ward, 1958). Yugoslav/Croatian economists were also well aware of it.

constrained the enterprise's freedom in the distribution of income and regulated inter-sector average wages. As a result, "The basic principles and criteria for the distribution of income and the allocation of funds to personal incomes are laid down by workers in line with the basic principles and criteria established by self-management agreements and social contracts"(Miljevic, 1971:8).

Under such circumstances during the socialist sub-period, one could assume there was a continuous underlying pressure for an increase in wages and wage differentials in line with opportunity costs. Lydall coments that "In the absence of a satisfactory theoretical basis for determining the level of personal income, Yugoslav enterprise pay out as much income as they can, given the market, political and administrative constraints to which they are subject" (Lydall, 1984:240).

The inability to build institutional coherence into the system of wages led to wage increases being regularly singled out as a major source of instability. This increasingly led to outright policy control. These policies never regulated wage differentials, which were respected as the prerogative of enterprise and self-management agreements, and only targeted the size of the enterprise wage fund, usually by limiting its increase to the rise in productivity. This made incomes policy of limited use as a demand management policy. Wage freezes were imposed in five major stabilization efforts, (1972, 1981, 1985, 1989 and again in 1990). But wage policies were also increasingly influenced by fear of social unrest as early as in 1981 (Nikic 1982) and this fear only rose with the economic stagnation and rising political demands of the eighties.

2.2 WAGE DETERMINATION DURING THE CAPITALIST PERIOD (1990-2008)[4]

With regard to labour market outcomes concerning wages, 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 why stability was nevertheless greater is that after 1990 there was a continuous development of one coherent institutional

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

and regulatory system (which, after EU membership negotiations started, was largely influenced by the *acquis communitaire*) and after the successful 1993 stabilization policy there was price and exchange rate stability.[5]

Regarding labour outcomes and wage inequality, the most important event was the economic transformation. Capitalism envisaged a fundamentally different role of labour than socialism. This in turn implied two fundamental changes for wage inequality and wage differentials. The first was the acceptability of labour markets and capital markets, so that wage inequality and wage differentials could be viewed as labour 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 it was abolished.

In the mid-1990s, the first post-socialist institutional framework regulating labour relations was developed. A new Labour Code was passed by Parliament in 1995 that still maintained substantial labour market inflexibility; until then, the socialist law regulating 'working /labour relations' was operative. It was revised in 2003 when a new Labour code was passed that radically transformed the labour markets in three important ways: the state lost its monopoly on job mediation; the labor market was liberalized and unemployment benefits were revised, reducing entitlements; and the first elements of employment flexibility were introduced, reducing costs of layoffs and right to redundancy pay and unemployment benefits, and wage contract flexibility.

Parallel to the development of the institutional framework regulating labour markets and employment contractswas the development of the institutions of collective bargaining. The first national collective contract was signed in autumn 1992, but the government, with the approval of the trade unions, immediately suspended the parts related to wages and wage differentials because of the Homeland War.[6] In late 1992 a separate collective contract was signed for the public sector, which at that time covered over two-thirds of the economy. The tripartite body representing government, trade unions, and employers was established in 1994, marking the beginning of modern wage bargaining and collective contracts. From 1994

[5] The new institutional framework was heavily influenced by the international financial community through conditionality, most notably the World Bank and its financial support, and the IMF with whom Croatia signed a stand-by agreement in 1994 and later in 2001.
[6] It did this until 1994 by a series of decrees.

on, two-year collective contracts started to be signed, with sector and 'house' (firm level and mostly limited to large firms) contracts derived from them.[7]

With respect to wage inequality and wage differentials, the collective contract defines the elements that should be included in determining wages and it defines the wage as the sum of three parts: the basic wage, the stimulative part, and the additions. Although no reliable studies are available, experienced observers estimate that perhaps 60% of firms pay above the basic wage, on average about 20% more. The collective contract has another important component. It 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 labour, 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 labour and a range of 5.85:1. The 2001 revision of the multiples has a relative range of 6.36 and this is higher than the 5.85 from 1994 and would seem to imply a decompression. 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.

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. Again this was linked to a stabilization issue, this time the post-transformation hyperinflation of 1993.[8] The incomes policy was part of a stabilization package and it 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.[9] Even though a collective contract was accepted in 1992, the government introduced an incomes policy as part of the stabilization program. It suspended the negotiated wage differentials and introduced a wage freeze. Through a continuum of discretionary decisions and decrees, by-laws and other ways, the government regulated the rise of the wage fund below GDP growth. 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.

[7] In 2009 there were 845 registered collective contracts at all levels and 800 'house' contracts, covering about 850.000 employees (Begic 2010, p:219).
[8] The monthly October 1993 inflation was almost 30%.
[9] The policy was based on forward-looking indexing that envisaged a 24.9% increase in October and 4% increase in subsequent two months and zero wage bill growth in the first half of 1994 (all corrected for changes in employment); see Anušic et al 1995, p:87 passim.

2.3 CONCLUDING REMARKS

The Croatian economy was subjected to a continuous stream of institutional shocks. Indeed during the entire period from 1970 to 2008 there was never a period longer than four years without some such shock. Even though many shocks were not primarily or only targeting labour allocation and outcomes, there is ample justification to expect that each in its way did have an important influence on labour. In a monetary economy this influence should be reflected in wage inequality and wage differentials. Before attempting to establish this link between institutional change and wage inequality and wage differentials it is necessary to explain the available data and the inequality measures that will be used. This is the topic of the next section.

3. MEASURING WAGE INEQUALITY AND WAGE DIFFERENTIALS

3.1 DATA

We use two data sources for the analysis of wage dispersion and wage inequality from the early 1970s through 2008 in Croatia. The first data source is the distribution of registered fully employed workers[10] categorized by income intervals (net take-home wage) and the second is the distribution of employment and average net wage by a worker's level of education and vocational training. Both data sources were collected by the official government statistical office. Until 1990 this was the Republican Statistical Office (RZS) that was part of the Yugoslav system of statistics; since 1991, the data have been collected by the Republic of Croatia Central Bureau of Statistics (DZS). Until 2004 all data was published only in paper form, so all pre-2004 data needed to be transferred to electronic form before further analysis.

The period we analyze was chosen for reasons of data availability of these two data sets. The data for employment and wages by education and vocational training are available approximately every other year beginning in 1970 through 1988, and then annually from 1996 to 2008. The 1988-1996 employment data are unavailable, although we do have average wage data for each group in these years; this gap coincides with the breakup of Yugoslavia (1990) and the Homeland war (1991-1995). The grouped income interval data are available annually beginning in 1973, with the exception of 1980-81.

[10] Fully employed workers are those who work at least 182 hours a month. Partially employed workers are omitted.

Data for both datasets is collected in a regular survey conducted by the official statistical office.[11] 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 uniform, we chose to use only March data for every year in the sample.[12] From March 1991 until March 1995 data from the temporarily occupied territories are omitted. With the end of the Homeland war in 1996, the data refer to the whole country, as does the data before September 1991 (Statistical Yearbook, 2007, pp.79-85, 114-120).

In the educational/ vocational attainment data set, educational attainment is defined officially as "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, we refer to this group as Advanced Degree (Adv Ed). Advanced Degree is followed by the Non-university college degree (Nu Coll), Secondary school education (Sec Ed), Basic school education (Basic Ed), Highly-skilled (HighSk), Skilled (Skilled), Semi-skilled (SemiSk) and Unskilled (Unsk) levels. The number of levels of educational/ vocational attainment did not change over the time period and are in agreement with definitions used by the ILO, so the data is comparable over the entire analyzed period.

The monetary denomination changed several times during the analyzed period due to currency changes. In January 1990 the Yugoslav dinar (YUD) was substituted by the Convertible dinar (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 being equal to 1 HRD. As a consequence of high inflation in May 1994, the Croatian kuna (HRK) was introduced, with 1,000 HRD being equal to 1 HRK. Thus, the income data from 1973 until 1985 are in Yugoslav dinar (YUD), data for 1988 in Convertible dinar, 1990-1993 data in Croatian dinar (HRD,) and data after 1993 in Croatian kuna (HRK).

When we examine real wages, we transform all wages into kuna, using 2005 prices. Our inflation adjustment combines two different price indices. Prior to 1998, no complete CPI exists, so we use information on retail price indices. Retail prices are

[11] Until 1989 this was the RAD-1 questionnaire completed by firms in the census and from 1996 the RAD-1G questionnaire.
[12] The 1996 changes were a result of the completion of the Homeland war in 1995 after which statistics were re-organized.

"prices that a consumer pays for certain products or services in retail trade. The statistics monitors the prices at which, during the reported period, the biggest quantities of selected products are sold at the selected selling points" (Statistical Yearbook 2008, p.185). Beginning in 1998, we use the official Consumer Price Index for Croatia. Our combined price series, obtained from the Republic of Croatia Central Bureau of Statistics, is presented in Appendix Table 1. Our retail price index may overstate inflation if wholesale prices increased more slowly than these prices. This, in turn, would affect our calculations of real wages, but would not affect our estimates of wage dispersion and wage inequality, since these are based on relative wages.

In neither data set do we have access to true microdata that would enable us to compute ideal measures of overall inequality. The grouped income interval data are non-overlapping, but the intervals 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 we would like.[13] The attainment data are preferable in this respect, but they are obviously from potentially overlapping distributions. For example, the net wage of the highest paid skilled worker may by higher than that of the lowest paid non-university college degree worker and so on. Finally, the interval data are for full-time workers only, so this also works to reduce measured inequality. Our general strategy is to work with both data sets, note the probable biases involved, and see if a reasonably clear consensus nevertheless emerges.

3.2 Methods

We calculate two standard inequality measures, the Gini coefficient and the Theil index. The Gini is a common and intuitively understandable measure. The Theil is less well known but has some attractive properties.

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. It is often expressed graphically as the ratio of the area between the Lorenz Curve and the line of perfect equality to the entire area under the perfect equality line.

[13] We assume that the average income in the top bracket is twice the minimum threshold in that bracket. The percent of workers in that top bracket varies from as little as .5% to as much as 8-10% (1985 and 1989).

The Theil measure was originally derived from information theory (Theil, 1967). However, it is readily interpretable as a measure of inequality. Conçeicao, Galbraith, and Bradford (2001) show that its formula can be re-arranged as a "direct measure of the discrepancy between the distribution of income and the distribution of individuals" (Conçeicao, Galbraith, Bradford, 2001, p.492). Thus, for example, if a group has the same share of income as its share of the population, it does not contribute to inequality. The Theil index is, like the Gini, bounded at 0 for perfect equality, but, unlike the Gini coefficient, it does not have a natural maximum value; rather, its maximum is a function of the number of income units. In our analysis, however, this is not a problem, because during the whole period the number of levels of educational attainment (8), while the 14 income brackets for the distribution of net wages in the 1970s can easily be reduced to the 13 published for the second part of the period. This allows for the comparability of the Theil index during the period.

Conçeicao, Galbraith, Bradford show further that "the structure of the Theil index measuring inequality between individuals is similar to the Theil index structure measuring inequality between groups" (Conçeicao, Galbraith, Bradford, 2001, p.492). This is particularly valuable when aggregate 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.

Each of the two inequality measures can be calculated in two ways, depending on whether the underlying data is grouped or ungrouped. Given our data, we use the appropriate grouped data formulas. For the Gini coefficient, we compute both lower and upper bounds. The upper and lower bounds estimation is necessary since we know nothing about the distribution of incomes within groups. The Gini upper bound values assume maximum inequality within every bracket (i.e., all income recipients have either the maximum or minimum income in the bracket), while the Gini lower bound values assume no inequality in any wage bracket (all income recipients have income equal to the mean of the income bracket). Equations (1) and (2) for the two Gini measures are taken from Cowell (1995, pp.111-115 and p.147).

(1) $$G_L = \frac{1}{2}\sum_{i=1}^{k}\ \sum_{j=1}^{k}\frac{n_i n_j}{n^2\bar{y}}\left|m_i - m_j\right|$$

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

In equations (1) and (2), n is the number of observations, y is individual income, $\bar{y}$ is average income, a_i are income classes with upper and lower boundary values, k is the total number of income classes, μ is class mean and i is population relative frequency in income class i.

The Theil index for grouped data is given in equation (3) taken from Conçeicao, Galbraith, Bradford, 2001):

$$T = \sum_{i=1}^{n} \frac{y_i}{y} \ln\left[\left(\frac{y_i}{y}\right) / \left(\frac{1}{n}\right)\right] \quad (3)$$

In (3), n is the number of observations, y is total income and m is the number of groups. As equation (3) shows, the grouped Theil index can be interpreted as an income-weighted average of the natural log of the ratio of a group's income share to its population share.

Because the Theil measure is less familiar than the Gini, it is worth noting some of its properties. In a very simple economy with two equally sized groups, the Theil index ranges from 0 when both groups have equal incomes to 0.6371 when one group has 1% of the income and the other has 99%.[14] In a more extreme case where one group has 1% of the population and 99% of the income and the other group has the remaining income and population, the Theil index equals 4.559. As can be seen in (3), if a group's income share equals its population share, then its contribution to the Theil index is 0 (=ln 1). A group with an income share greater than its population share contributes positively to the index and a group with an income share less than its population share contributes negatively. For income shares greater than population shares, the contribution to the index is an increasing function of the difference in the shares, as expected. The contribution of groups with less income than their population share is more complicated, because algebraically they contribute negatively to the inequality index as if they reduced inequality. With a bit of arithmetic, it is not hard to show that a group with a very low income to population share ratio will have a negative Theil contribution that is small in absolute value, that is, it reduces the Theil index less (and is compensated for by another group that will have an income share greater than its population share).

For the analysis of the Theil index, we also present a decomposition that shows the contributions of each subgroup to overall measured inequality (Conçeicao and Ferreira, 2000). This allows us to identify the specific sources of the change in inequality.

[14] Using equation (3), in this example T=.01 x ln (.01/.5) + .99 x ln(.99/.5) = -.0391+.6763 =.6371.

As explained above, the decomposition of the Theil index has both positive and negative contributions, which are a function of both the relative population and income shares and the weighting for each group. Changing contributions to the index can occur either when the relative population and income shares or when the weighting changes.

3.3 Wage dispersion in Croatia, 1970-2008

Before turning to wage inequality, we first show in Figure 1 the path of average real wages in Croatia. We use average wages from our two data sets, both to show the broad trend and to examine the comparability of the two income sources. Average income is provided directly in the attainment data set; in the income interval data, we compute it from the average income in each bracket, assuming that the average bracket income equals the bracket midpoint and that the average income in the top bracket is twice its minimum. Because 1974 is the earliest year with data in both data sets, we begin our series in that year and normalize both series to 100. Not all the years are available in each data set. As we noted earlier, our real wage adjustment is sensitive to the measurement of price changes, and we do not have a full consistent price index series.

The two average wage series are reasonably close to one another, which is reassuring, and they tell a consistent story. The path of average wages shows four distinct time paths: reasonably steady growth from 1970 to 1978; a steady decline from 1978 to 1988 during which wages fell by about 35% in the attainment data and by more than half in the interval data; precipitous declines in 1989 (information available in the income interval data only) and again from 1990 to 1993 when wages fell by another two-thirds and bottomed out at just 15-30% of the 1974 level; and then a steady recovery through 2008 that brought average wages back to almost 90% of the 1974 level in the attainment data and just barely above the 1974 average in the interval data. As shown in the figure, the volatile 1988-94 period corresponds to the major external shocks, including two bouts of hyperinflation.

We begin our analysis with the most often-used approach to wage dispersion, i.e. the calculation of annual changes of relative nominal average wages by skill group. Figure 2 depicts the time path of relative wages for each educational and vocational group relative to the average wage in that year. For example, the top line shows that workers with an advanced degree earned about twice the economy-wide average in 1970, but have lost ground since in three distinct episodes (1970-78, 1978-90, and 1990-99). Since 2000, their relative income has been stable at a figure about 60% about the overall average. The

other two groups initially well above the average –those with a non-university college degree (Nu Coll) and those with high skill vocational training (HighSk)—also experienced a decrease in their relative earnings. The time path of wages is similar to that of the workers with an advanced degree, but somewhat more moderate. By the end of the period, their wages were 19% (Nu Coll) and 6% (HighSk) above the average, compared to 50% in 1970.

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 which 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 wage inequality. The decline is least, though, for the two groups with the lowest 1970 wages – semi-skilled and unskilled workers.

It is interesting to see how the shape of the whole distribution changed. The common perception is that there was an artificial compression of wage differentials during socialism (the first 20 years of the period under review) when there were no institutionalized labor markets and substantial egalitarian pressures. The same common perception is 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 2 certainly do not support this. Taking the most primitive measure of the ratio of the highest (advanced degree) and lowest (unskilled labor) average shows that the introduction of markets actually reduced the relative range. Also, the average of those with an advanced degree, a non-university college education and highly skilled workers are during the whole period above the average, but their relative position in the capitalist period is significantly below that in the first period. Of course, one must remember that the data points are averages representing a whole distribution and that the distributions are mutually overlapping.

Visually, the figure suggests a probable decline in overall between group inequality between 1970 and the early to mid-1990s and an increase thereafter. In 1970, average group 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. 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.[15]

Figure 3 uses the average wages by educational and vocational attainment to compute grouped Gini and Theil inequality indices. In computing both measures, we assume that all workers in a group receive the average income of that group, an assumption that clearly reduces the overall inequality.[16] In effect, we compare the difference between group income and population shares across all the groups whose income trend was shown in Figure 2. Both measures reveal the same pattern. Overall between-group inequality declined through the early 1980s, bottoming out in 1983. Our data points are thinner over the next dozen years, but by both measures, inequality remained about the same through 1996. Then inequality increased steadily through 2001, rising back to its level in the early 1970s. Since then, both measures indicate that inequality has stabilized at this higher level.

We can use the Theil measure to identify the source of the increase in inequality, since each group makes a uniquely-identifiable numerical contribution to the index. To simplify the exposition, we have combined like groups: non-university and secondary education; high-skilled and skilled workers; and semi-skilled workers and those with basic education. Workers at the extremes of the skill distribution (Advanced education and unskilled) are kept in their own group. Figure 4 shows the result of this decomposition of the Theil index. In each year, the sum of the group values equals the total inequality index shown in Figure 3; over these years, the index fell from .055 to .043. The time pattern is one in which the workers with advanced educational degrees contribute an increasing amount of inequality, beginning in about 1988, while the other groups contribute an offsetting decrease. The four other groups effectively converge in their inequality contribution by the early 2000s. The explanation turns on changing relative importance of the group, rather than a wholesale change in income shares relative to population. In 1970, workers with advanced education had an income share twice their population share compared to 60% more in 2008, but their share of the population and of income more than tripled. As a result, that group is the primary driver of inequality simply as a function of increasing size. In contrast, unskilled workers actually had a lower

[15] It is interesting to compare these relative wage trends to those in the US and Western Europe over this time period. In the US, wage differences by education declined through the mid-1970s, but have increased steadily and substantially since then.
[16] In the US context, much of the observed increase in inequality is within educational groups. See Juhn, Murphy, & Pierce (1998).

share of income relative to their group size in 2008 than in 1970, but their share of employment fell by two-thirds, from 25% to 8.1%.

3.4 Wage inequality in Croatia, 1970-2008

It is interesting to relate wage inequality results based on attainment to the wage inequality based on the distribution of all fully employed workers by their net or take-home wage. This section thus analyzes overall wage inequality (inequality of take-home wages). All fully employed workers are included, regardless of their age and other characteristics. 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.

The data does not contain the average of the distribution, thus when calculating Gini coefficients with upper and lower values, some assumptions have been made. First, we assume that the first income bracket starts at zero income, thereby neglecting that also negative incomes could exist. Second, we assume the mean income of each income bracket is just the average of the lower and the upper bound. Thirdly, we assume the mean income of the upper bracket is twice the lower bound in that bracket. The percent of workers in that top bracket varies from as little as .5% to as much as 8-10% (1985 and 1989). The results are depicted in Figure 5.

One would expect socialism and capitalism regimes to have stable movements in inequality with socialism having a lower trend value, but looking at Figure 5 it is clear that both Gini and Theil indices show the same dynamics of a secular increase in overall wage inequality. The initial, 1973 Gini was 0.21 and the final, 2008 Gini was 0.32; the Theil index increased similarly, from 0.077 to 0.193. Figure 5 also indicates a period of stable increases in inequality at the beginning of the period (from 1973 to 1979) and at the end (from 2000 to the latest data) with cyclical variations around a rising trend between them. The 1980s and 1990s were very turbulent with two distinctive periods of rising wage inequality (1989 and 1998). The instability is not surprising considering that during that 20-year period there was a regime change (starting in 1989), the military conflict (1991-1995) and the continuum of short-term macroeconomic stabilization policies (1982, 1986, 1988, 1989, 1992 and 1993).

Many of the year-to-year movements appear to reflect the impact of stabilization policies. For example, the fall in inequality from 1979 to 1982 is almost certainly the result of incomes policies. Inflation and balance of payment problems led to a stabilization policy in 1979 and then, after it failed, a drastic stabilization policy in 1981. Inequality rose between 1983 and 1985 as the income policy was ended and a pro-market climate was created. The exceptional rise in 1989 appears to be related to timing. There was accelerating macroeconomic instability (inflation balance-of-payments, etc.) and wage deregulation. Income data is gathered in March, prior to the implementation of a very rigorous stabilization policy in June- The rise is consistent with rising instability and the fall with a stabilization policy.

The rising wage inequality from 1991 to 1993 likely reflects the chaotic period linked to the decomposition of Yugoslavia and the imposition of new transformation policies that made a complete break with the socialist regime with privatization and market liberalization coinciding with the Homeland war which was financed through inflation. The government attempted to control wages, but with accelerating inflation real wages fell dramatically. The falling inequality observed between 1993 and 1995 coincides with the implementation of a successful anti-inflation policy, which included a strict control over the firm wage fund and frozen wage differentials. Furthermore, the wage differentials agreed in collective bargaining were suspended. Wage inequality then increased again from 1995 through the spike in 1998. During this period wage differentialswere deregulated and the economy started postwar renewal. Inequality fell in 1999 back to the pre-spike trend. There were no new policies or any significant institutional change that could explain the changes in the same was as in previous such events. There was, however, a recession in 1999 (negative growth rates) and an increasing number of wage arrears started in 1998.

The last period is from 2000 to 2006, 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. Regarding labour it was also a period of high growth, largely financed by a rising foreign debt, and rising employment. Even the labour market reforms of 2003 do not seem to have had an effect.

Figure 5 shows two, one-year period spikes in inequality in 1989 and in 1997. The 1988-89 spike could be related to problems created by the difficulty in predicting inflation at the time wages were negotiated in Decœmber. It was a period of rising

inflation, so the distribution moved in the favor of top brackets. After successful stabilization in the early 1980's, there was a policy principle of "targeted inflation" after 1986 that led to a surge in wages and inequality, inflation and trade deficit. It was also the time of rising political uncertainty with the demise of socialism and the erosion of communist party power. Overall the turmoil of the 1980s led to a new stabilization policy in 1989 (so called May Measures).

The 1997-98 spike is harder to explain by the doubtful statistics since it was a period of price stability and there were no special policies or other changes. But there was at the time a rise in wage arrears, reaching 15-20% of the labor force that got irregular payments.[17] Rising wage arrears should increase inequality if workers at the lower end of the distribution were more subjected to it. What is also interesting to mention about the period is the increasing unofficial economy, estimated at the time to be about 25% (Katarina 2002), and probably more important, increasing tax evasion (reducing social security and health payments by paying everything over the minimum wage in cash). Wage-related tax evasion should reduce formal inequality, if only higher wages were more subjected to it, hence the fall in 1999. In 1999 VAT was introduced, which is self-enforcing, so incentives changed.

As mentioned in the section on wage dispersion, a very useful characteristic of the Theil index concerns its decomposability. This allows us to see which groups contributed most to the changing level of inequality. The results are shown in Figure 6. Thirteen income groups are too many to show visually, so we combine adjacent groups to simplify the presentation. We combine the bottom three income groups, intervals 4-6, 7-9, and 10-maximum. As explained earlier, groups with an income share larger than their employment share increase the Theil index and do so more, the greater the disparity between the two shares. Groups with an income share smaller than their employment share decrease the Theil index, but do so by less, the smaller is their population share. To provide context with the inequality trend, we also shown the overall Theil index; it is the second line from the top.

We see in Figure 6 that the bottom six income brackets reduced over-all inequality, meaning their share in employment is larger than their share in the wage fund. More importantly, the trend for these two groups is not especially volatile; their contribution is virtually identical at the beginning and end of the period and does not vary much in between. The interesting feature of Figure 6 is that the two lines depicting changes in the top end of the income distribution are almost mirror images

[17] There is no hard data to support this claim.

during the whole period: the declining inequality contribution of the upper-middle brackets is compensated for – and then some—by the increasing income share and population share of the top brackets. Furthermore the top three intervals follow the changes in overall inequality quite closely and fall with every stabilization/anti-inflation policy and expand with every deregulation. On the basis of this, it seems that these policies asymmetrically reduce incomes in the top end while lowest incomes change less. For example, a stabilization policy may reduce the inequality contribution of the top end both be reducing its income and reducing its share while the 'bunching in the middle' may actually increase the share of the top quarter.

Another interesting feature concerns the two periods of stable changes in wage inequality (1973-1978 and 2001-2006). Looking at the decomposition data they appear different. The first period implies a level of volatility among all groups but the second has a stable structure and stable change in overall inequality. A further characteristic is that during the latter period all income brackets expect the top 3 reduce inequality with the contribution of the top end of the distribution increasing. This may mean that according to the Theil decomposition after 2000 the increase in inequality resulted from the rising economic fortunes at the top end of the distribution.

3.5 Sectoral wage inequality

This section deals with the wage inequality in different industrial sectors of the Croatian economy. We organized sectors into broad categories depending on the "shocks" they faced during the transition from a centrally-planned economy to a decentralized one. We identified four different categories of sectors and shocks that arguably might have resulted in different labor market responses that would generate different changes in inequality.

The first is a sector whose firms were continually exposed to market competition and that continually operated under market pressures. They faced competition both on the internal market and in exports. In the internal market the competition came from other domestic firms, imports and FDI. On the external market they competed through exports. As a result, during the whole period they were in a 'contestable market' position so the transformation may not have implied such a large change. The second category was for firms in a sector that during the whole period was heavily subsidized and state owned. One would not expect firms in this sector to go through the process of transformation-inspired change. The third category was for

firms in a sector especially hard hit by the transformation, typically because the sector was made artificially large under socialism and so, with the loss of government support and subsidies, had to undergo major structural downsizing. The fourth were firms in a sector that attracted FDI. This sector underwent change because prior to 1990 this was not an available option and with FDI came new management techniques, business ethics and technologies.

The sectors representing of each of these scenarios were chosen on the basis of the actual experience of industrial sectors. We used textiles to represent the continuously competitive sector. Textiles were largely restructured and downsized and faced increasing competition from overseas producers in all market segments but were never subsidized. Shipbuilding is our example of a continually state-owned and subsidized sector: shipbuilding enjoyed a boom in socialism and its system of regulated foreign trade and has remained in state ownership, heavily subsidized. In spite of multiple attempts, it has been unable to restructure. As an example of a transformation-changed sector, we use metal machinery and equipment. (Croatia had a large machine and equipment producing sector, which largely supplied other parts of Yugoslavia and other socialist countries. It could be labeled a transformation 'loser'. Finally, as a high FDI sector, we use financial intermediates. This is also a sector against whose development socialism explicitly opposed. Now over 85% of banking assets in Croatia are foreign owned. In many ways, this industry is a likely transformation winner.

Levels of inequality across sector are not meaningfully comparable because the underlying employment structure may vary; some may intrinsically have more homogeneous employment than others and thus have lower baseline levels of wage inequality. The issue we focus on is the change in inequality.

To simplify the analysis, we compare inequality changes across two time periods, one before the major shocks and one afterwards. Most of the transitional shocks occurred in the late 1980s and early 1990s. To provide a broader sample and avoid possible problems that might arise from a single potentially unrepresentative year, we use two four-year periods, 1983-1986 and 2003-2006. We use the Gini coefficient as our inequality measure. The analysis is based on the income interval data, available separately by industry, which was previously used in Figures 5 and 6. The results of this analysis are given in Figure 7.

The results are generally as expected. All sectors experienced a rise in wage inequality, consistent with the overall trend in the economy. The largest increase in inequality occurred for the privatized, high FDI sector where the Gini index rose from

0.21 in the 1980's to 0.31 recently, an increase of almost 50%. Interestingly, this sector is known for employing foreign managers and for having boards dominated by foreigners and may, thus, be less constrained by domestic social norms. The second largest increase is in the competitive sector (textiles). The other two sectors both had very small increases. But the increases did change the rankings. The sector least influenced by the transformation (because they were always competitive, textiles or remained in state protection as shipbuilding) changed least. The ranking of the sector hardest hit by the transformation and the one that hosted most FDI changed most in opposite directions the transformation 'loser' has lowest wage inequality and the FDU one has the highest.

4. 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. We also examined differences in inequality across industrial sectors, focusing on industries that experienced quite difference economic shocks during the transformation from socialism to capitalism.

The data we use is far from ideal: it has time gaps, it is aggregated, and the samples are not fully inclusive of all wage earners. Nevertheless, it tells a reasonably 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.

Table 1 summarizes the broad inequality trends by period (socialist through 1988 or 1990, capitalist thereafter). Because our two inequality measures track similarly, we focus here on the Gini coefficient. The income interval data, which is our preferred source for measuring inequality, shows that the Gini coefficient rose moderately in the socialist period and more strongly in the capitalist period. There are considerable year-to-year fluctuations in both periods, but the average Gini coefficient value increased from .241 during the social period to .297 in the capitalist period. The educational and vocational attainment data are consistent with this in part. With this data, we find a decline in inequality in the socialist period, although it is largely a function of a relatively high initial year value (see Figure 3). Inequality clearly rises in the capitalist period,

especially (again see Figure 3) in the first decade of the transformation. The percentage increase in the Gini coefficient is quite similar in the capitalist period for both data sets.

Over the entire period, five commonalities spanning the socialist and capitalist periods are evident. The first is the long term increase in wage inequality in both periods. The second surprising characteristic is how responsive wage inequality is to policy and institutional changes. Every change in the trend but one can be linked to one or both of the two. This is true both of the socialist and capitalist periods. While one would expect this in a socialist economy where there was extensive regulation and government interference in the economy (overt or covert), it may be surprising for the capitalist period. Probably the extended transformation can best account for this. The only institutional change that did not have a visible impact on the data was the market deregulation of 2003. The third commonality is that every stabilization or anti-inflation policy significantly reduced wage inequality. This is true of four out of five stabilization policies in the social ist period (1971, 1979, 1981 and 1989) and the only one in the capitalist period (1993). The only exception is the stabilization policy of 1990. Fourth, in both regimes every liberalization or loosening control over wages, either because income policies were terminated or through policy deregulation, led to a rise in wage inequality.

Finally, during the whole period there are only two sub-periods of extended stability in inequality. Interestingly, they appear at the beginning and end of the period and mark a stable and slow rise in wage inequality. In spite of major differences, they have important similarities. In both cases there was a policy of increasing the external debt which allowed for domestic consumption to exceed domestic production. The first one ended in a decade of instability, the final decomposition of Yugoslavia, and the economic transformation. It is not possible to say how the second one will end, but there are indications that there will be a prolonged recession. It is worth noting that two large non-economic shocks, independence in 1990 and the Homeland war from 1991-1995, do not appear in the data either as a 'spike' (what one may expect from the former) or a period of homogenous behavior (what one may expect from the latter).

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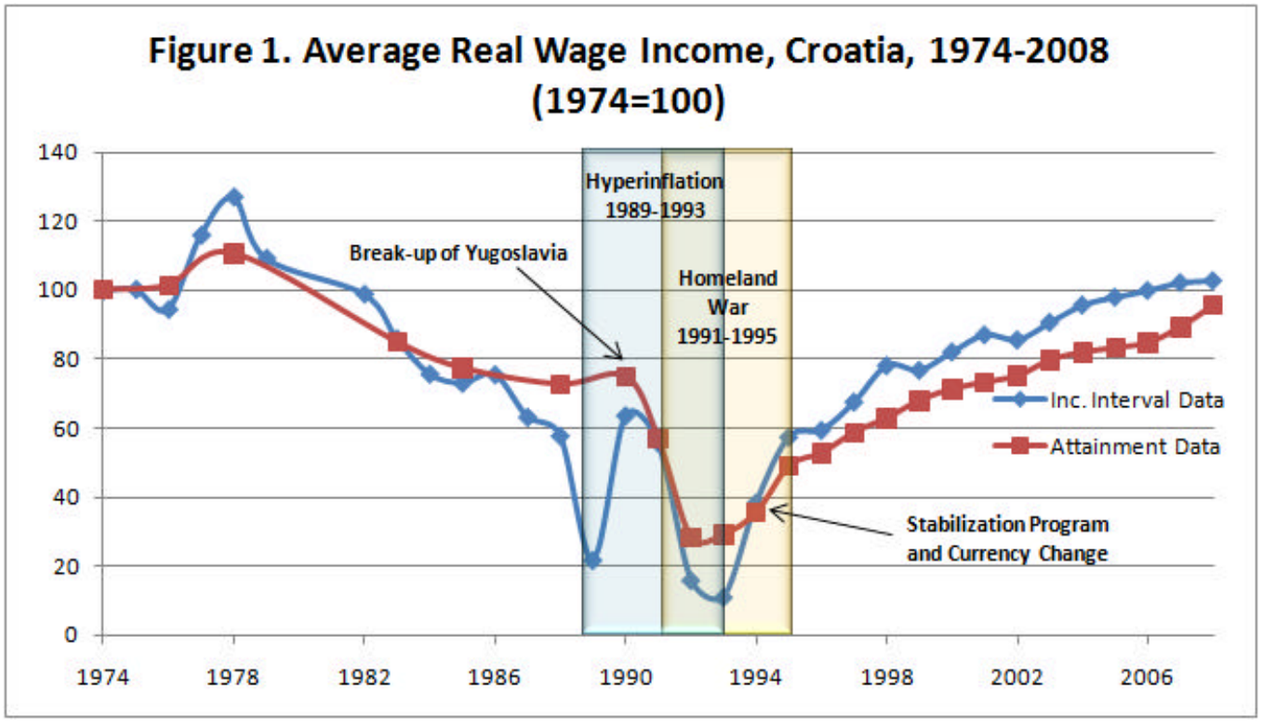
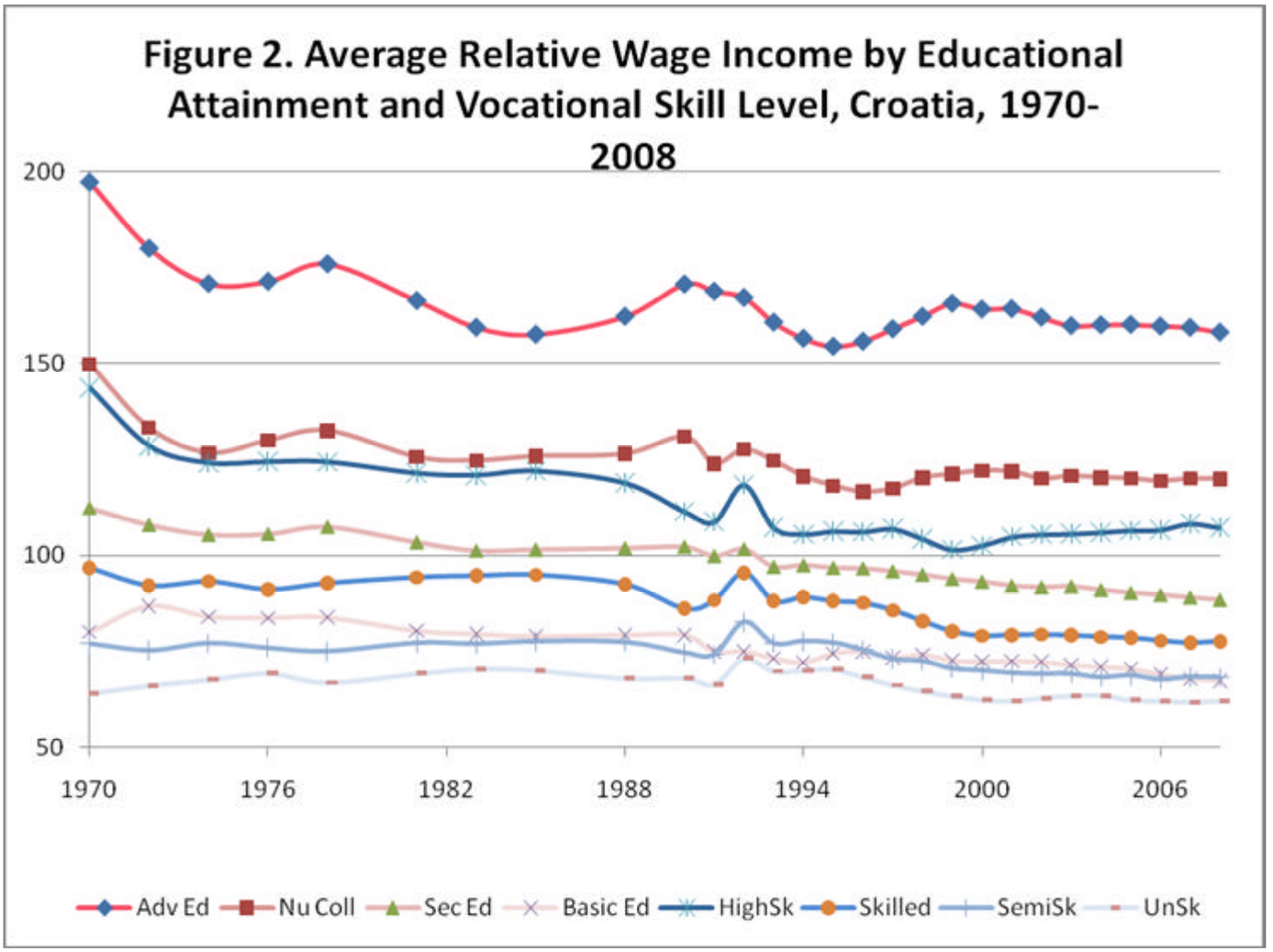
TABLE 1: WAGE INEQUALITY IN SOCIALIST AND CAPITALIST PERIODS, CROATIA, 1970-2008

	Grouped Distribution of New Wage	Education and Vocational Attainment
SOCIALIST PERIOD (1970-1989)		
Initial value (1970 or 1973)	.210	.179
End of period value (1988 or 1990)	.254	.136
Period Average	.241	.143
CAPITALIST PERIOD (1990-2008)		
Initial value (1990)	.262	.136
End of period value 2008	.333	.154
Period Average	.297	.152

Figures shown are lower-bound Gini coefficients.



Source: Average wages based on DZS data, 1974-2008. Inflation adjustments are shown in Appendix Table 1.



Source: Authors calculations based on DZS data, 1970-2008.

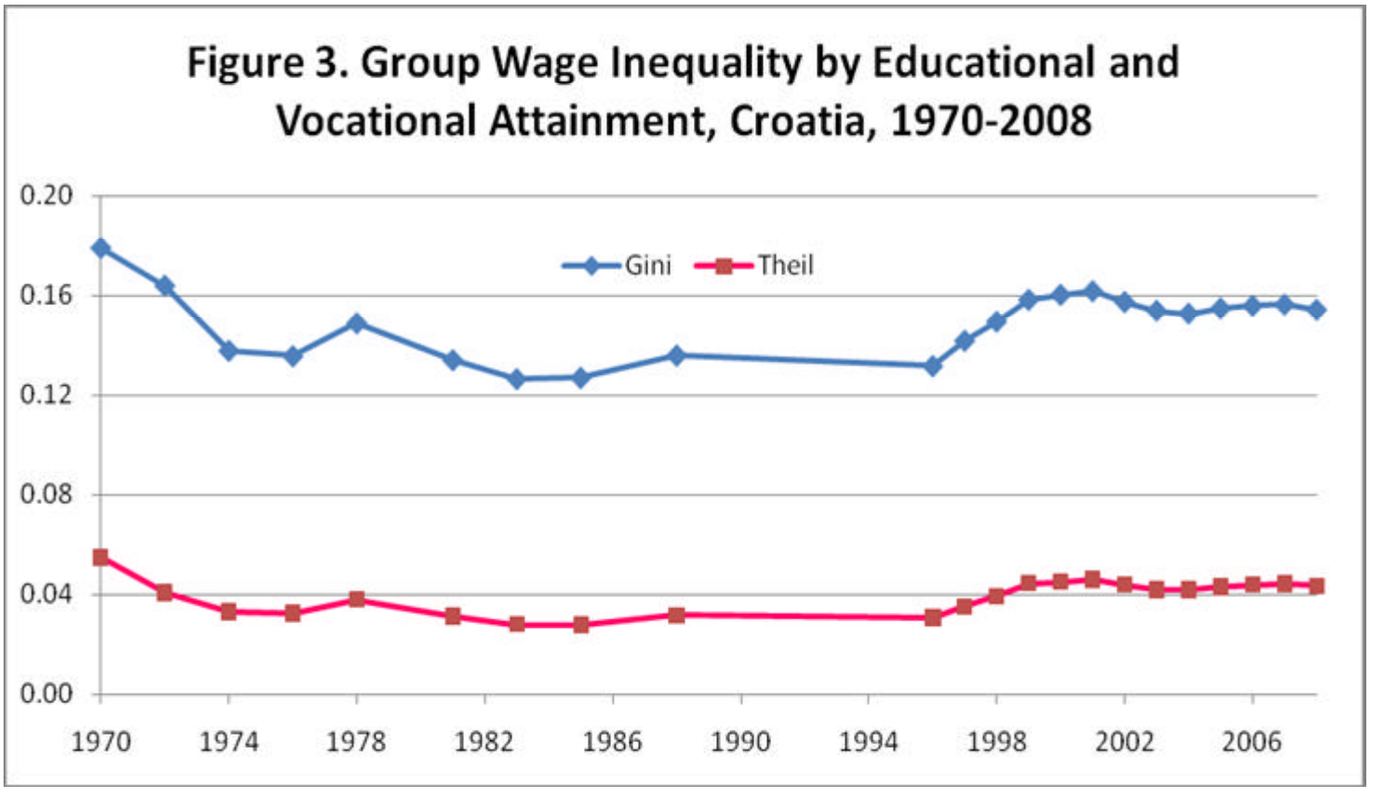


Figure 3. Group Wage Inequality by Educational and Vocational Attainment, Croatia, 1970-2008
0.20
0.16
0.12
0.08
0.04
0.00
Gini
Theil
1970
1974
1978
1982
1986
1990
1994
1998
2002
2006

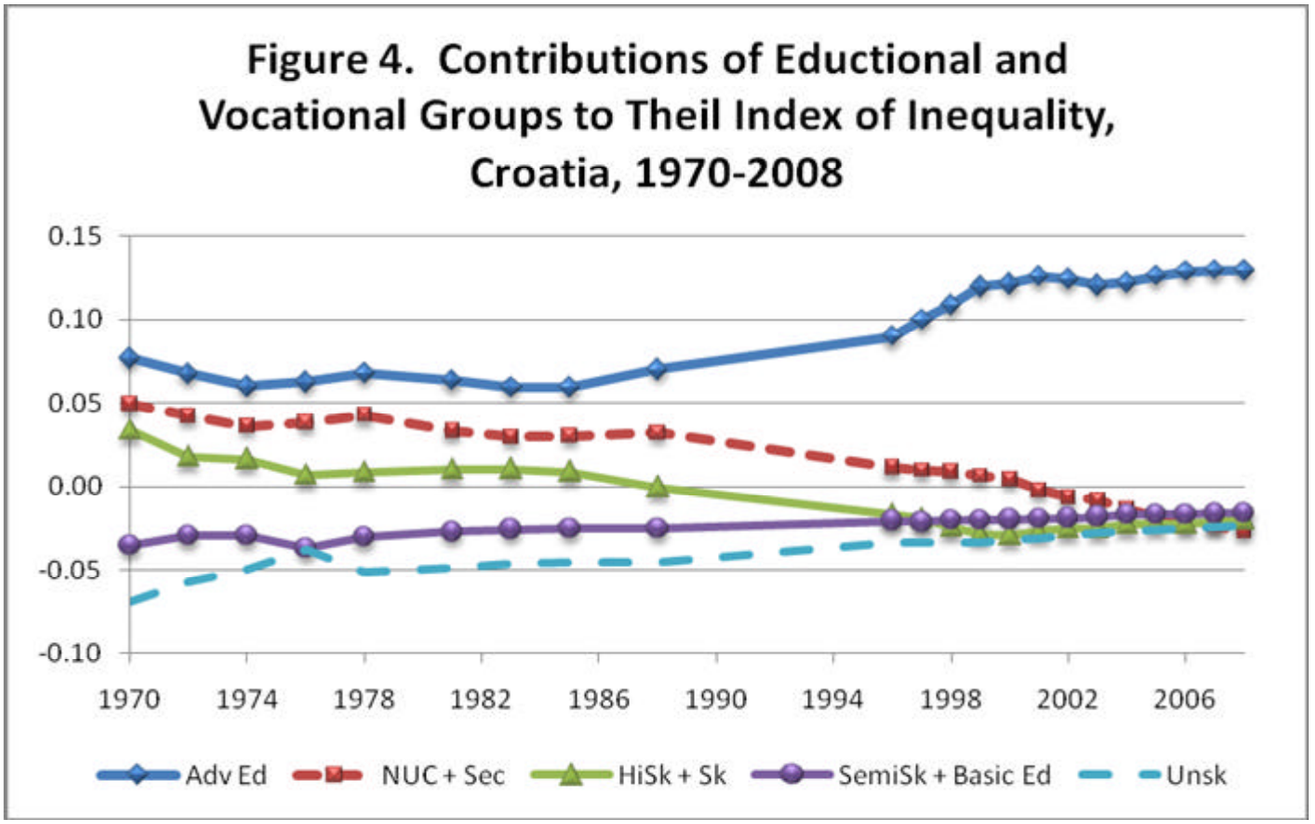


Figure 4. Contributions of Eductional and Vocational Groups to Theil Index of Inequality, Croatia, 1970-2008
0.15
0.10
0.05
0.00
-0.05
-0.10
1970
1974
1978
1982
1986
1990
1994
1998
2002
2006
Adv Ed
NUC + Sec
HiSk + Sk
SemiSk + Basic Ed
Unsk

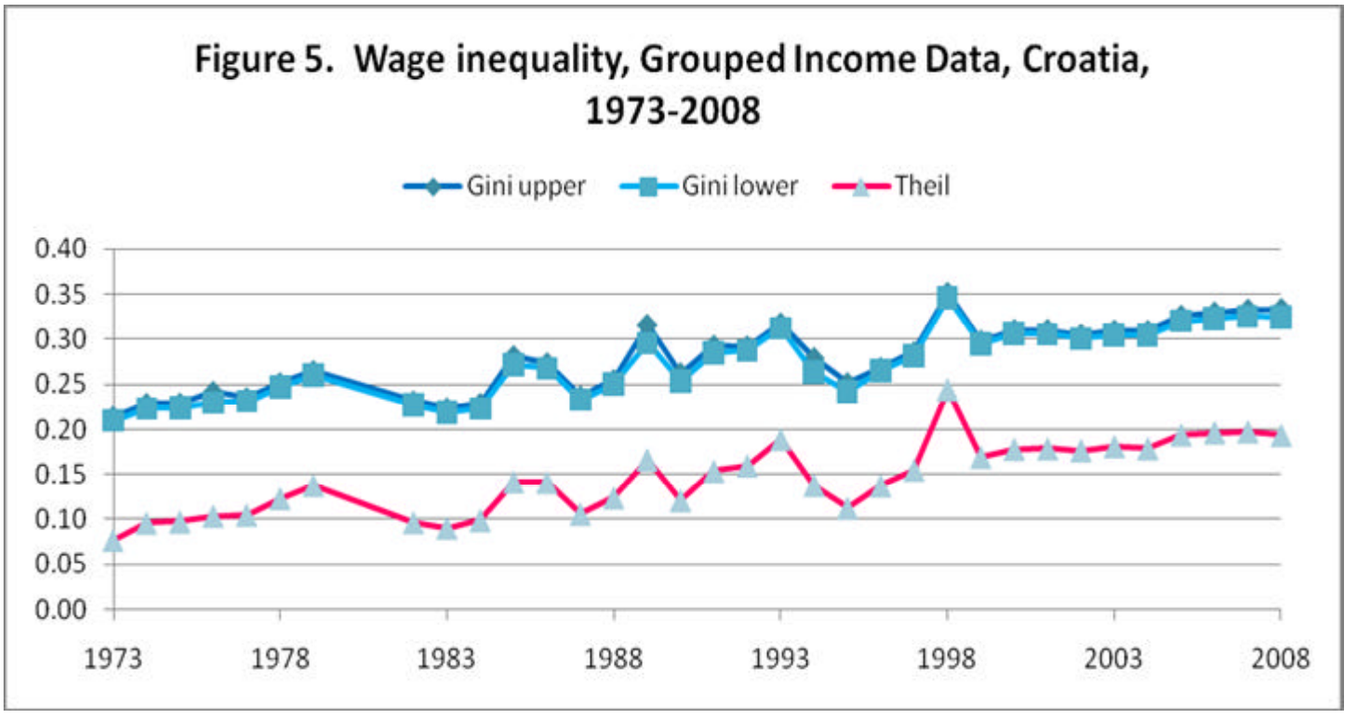


Figure 5. Wage inequality, Grouped Income Data, Croatia, 1973-2008
Gini upper
Gini lower
Theil
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
1973
1978
1983
1988
1993
1998
2003
2008

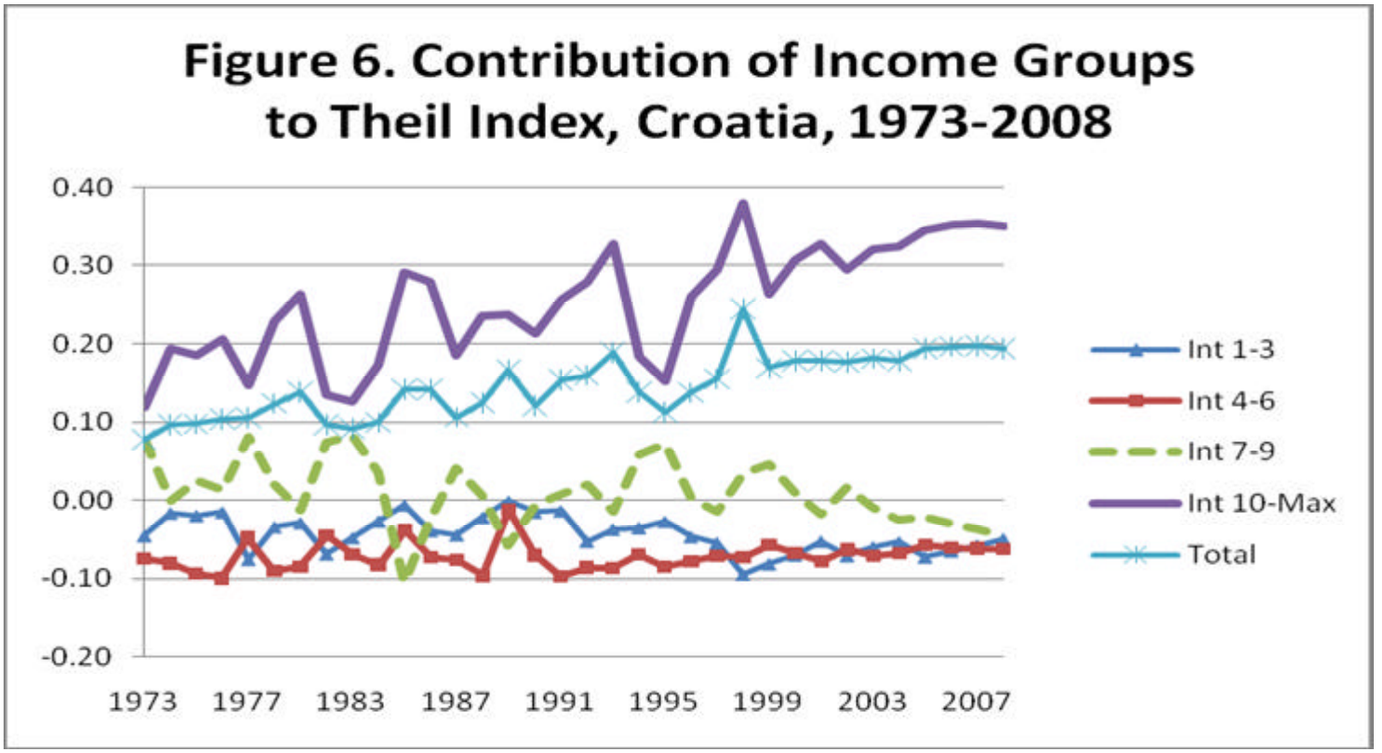


Figure 6. Contribution of Income Groups to Theil Index, Croatia, 1973-2008
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
1973
1977
1983
1987
1991
1995
1999
2003
2007
Int 1-3
Int 4-6
Int 7-9
Int 10-Max
Total

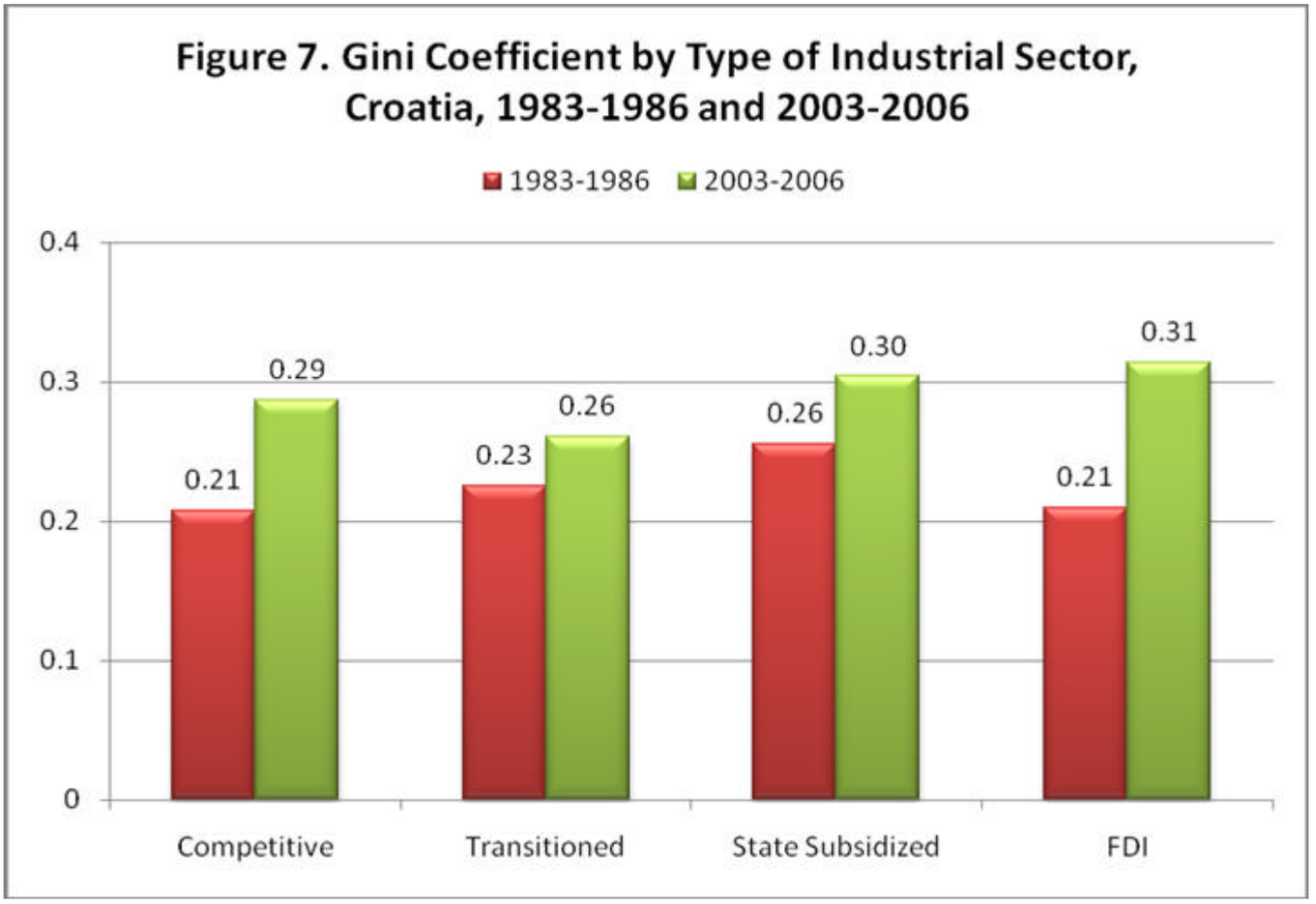


Figure 7. Gini Coefficient by Type of Industrial Sector, Croatia, 1983-1986 and 2003-2006
1983-1986
2003-2006
0.4
0.3
0.2
0.1
0
0.21
0.29
0.23
0.26
0.26
0.30
0.21
0.31
Competitive
Transitioned
State Subsidized
FDI

Appendix

Appendix Table 1: Retail and Consumer Price Index, Croatia, 1970-2006 (1970=100)		
Year	Price Index	Annual Inflation Rate
1970	100	
1971	116	16%
1972	135	16%
1973	160	19%
1974	200	25%
1975	255	27%
1976	278	9%
1977	316	13%
1978	360	14%
1979	443	23%
1980	587	32%
1981	849	45%
1982	1,106	30%
1983	1,554	40%
1984	2,427	56%
1985	4,254	75%
1986	8,125	91%
1987	17,924	121%
1988	53,790	200%
1989	699,269	1200%
1990	4,961,311	609%
1991	11,063,724	123%
1992	84,692,810	666%
1993	1,369,906,207	1518%
1994	2,706,934,664	98%
1995	2,761,730,913	2%
1996	2,858,994,253	4%
1997	2,961,737,219	4%
1998	3,130,235,682	6%
1999	3,255,445,109	4%
2000	3,405,696,422	5%
2001	3,534,036,085	4%
2002	3,593,510,563	2%
2003	3,656,115,277	2%
2004	3,731,240,933	2%
2005	3,856,450,360	3%
2006	3,978,529,552	3%

Note: Price Index is based on retail price index 1970-1998 and official CPI 1998-2006.