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Income Tax Progressivity in Croatia (1995-2002)

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Abstract: The aim of this study are twofold: first to determine how progressive the income tax is in Croatia and second, to examine if progressivity has changed during the period from 1995 to 2002. The reason for addressing this question is that conventional wisdom that prevails in Croatia is that the overall tax burden is unfairly distributed, i.e. that the system is not progressive enough. Due to data constraints, the progressivity of the overall tax system could not be assessed, so the authors had to be satisfied only with the progressivity of the income tax.

JEL Classification: H23, H24

Key words: Croatia, income tax progressivity

Application of the concept of progressivity in the taxation of income is considered to be one of the basic methods used in attempts to achieve an equitable distribution of tax burden in accordance with the ability-to-pay principle. Income tax is usually applied in order to alleviate regressivity of other taxes, most of all the VAT. In this manner the total tax burden is more equitably distributed.

Not a single comprehensive study of the distribution of the total tax burden has been conducted in Croatia yet, therefore, we have tried to make the first step in that direction by undertaking a research of the progressivity of the income tax. We will measure only the tax burden of the income tax (and social security contributions as part of income taxation).

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Income Tax and Progressivity

Concept of Progressivity

Progressivity is associated with the principle of vertical equity, because a tax is considered to be progressive when the richer citizens spend larger share of their income on taxes than the poor citizens. It is believed that the concept of progressivity is connected with the structure of taxes characterised by increasing tax rates. However, a more precise mathematic definition of progressivity is necessary.

First of all, we must provide a definition of income elasticity of tax. If tax (T) is a function of income (Y), then the answer to the question of how much the percentage change in tax (T) will amount to if income (Y) changes by one percent is called the income elasticity of tax (E). Elasticity (E) could be mathematically written in the following way:

$$E = (dT/T) / (dY/Y), \text{ or} \quad (1)$$
$$E = d\,T/d\,Y * Y/T \quad (2)$$

or if

$m(Y)$ = marginal tax rate = $d\,(T)/ d\,(Y)$, and
$t(Y)$ = average tax rate = T/Y

then income elasticity of tax can be expressed as the ratio of marginal tax rate to average tax rate, i.e. as:

$$E = m(Y) / t(Y). \quad (3)$$

A tax is regarded proportional when income elasticity of tax (E) equals 1 for all levels of Y. A tax is progressive when elasticity (E) exceeds 1, while it is regressive in cases when elasticity (E) is below 1.

Or, when $E > 1$ a tax is progressive,
when $E = 1$ a tax is proportional, and
when $E < 1$ a tax is regressive.

We can make the following conclusions from the ratio of marginal tax rate to average tax rate: a tax is proportional when the marginal tax rate equals the average tax rate; it is progressive when the marginal tax rate is greater than the average tax rate; and it is regressive when the marginal tax rate is below the average tax rate.

Or, when $m(Y) > t(Y)$ a tax is progressive,
when $m(Y) = t(Y)$ a tax is proportional, and
when $m(Y) < t(Y)$ a tax is regressive.
The described is also equal to the following expression:

$$\frac{dt(Y)}{dY} > 0 \qquad (4)$$

i.e. progressivity is reached when the average tax rate is an increasing function of income. A tax is therefore progressive if richer taxpayers pay a larger share of their income than it is the case with the poorer taxpayers. A tax is proportional when the average tax rate does not change with an increase in income, while it is regressive when the average tax rate reduces with an increase in income. It is exactly these definitions that are most widely used when talking about the type of distribution of tax burden by certain income brackets.

It is important to stress that various elements of income tax system may have impact on the income tax progressivity. This primarily refers to: (1) Tax base; (2) Tax relieves (allowances, deductions and credits); and (3) Rate structure. A certain level of progressivity of the income tax can therefore be achieved by using any of the mentioned determinants. For example, an equal impact on progressivity could be attained either by using a personal allowance, applying the zero income tax rate on the first income bracket, or replacing the personal allowance with tax credits. All three determinants should be taken into account in the course of comparing and explaining the income tax progressivity in various countries, or different time periods (subject to changes in the tax legislation) within one country.

Progressivity Measures

Although a consensus has been reached on the conventional definition of progressivity according to which a tax system is progressive if the average tax rate increases with an increase in income, no consensus regarding an adequate measure of progressivity has been reached. We should emphasise that all of the above written definitions of progressivity refer to the measuring of progressivity at a certain level of income scale, and that they do not provide an unambiguous indicator of the total progressivity of the whole scale. However, it usually happens that the tax system A is more progressive than the tax system B at certain income levels, while the tax system B is more progressive than the tax system A at some other levels of income. These systems, therefore, differ in the level of their overall progressivity and it is hard to specify which tax system is more progressive (A or B) only by comparing various average tax rates imposed on different income levels. In order to overcome this

problem, many progressivity measures have been developed in the economic literature with a goal to determine the level of total progressivity of a certain tax or an overall tax system by using a single figure, a global index or a summarized tax progressivity measure.

The existing measures can be roughly grouped into two groups: structural measures and distributive measures.

Structural measures are based on the calculation of the tax liability at different income levels. The purpose of structural measures is to explain important characteristics of a tax system relating to tax liability at different income levels. According to the structural measures, a tax is progressive when the average tax rate increases with an increase in income before tax (in other words it is progressive when the average effective rate increases). With regards to the types of the structural measures, the most important once are: (i) observation of trends in average effective rate by income brackets; and (ii) measuring of the tax elasticity at certain income brackets or the total tax elasticity of the whole income distribution. This approach was taken in conducting this research.

Further, distributive measures take income redistribution as the criteria of progressivity and compare the distribution of income before and after taxation. These measures, therefore, depend on the total income distribution data, while structural measures require information on certain income brackets only. As these measures measure the impact of tax on income distribution, a certain tax can be regarded as progressive if it decreases distribution inequality. These measures are closely linked to the concept of inequality: if a tax is progressive, it means that income after taxes is more equally distributed than income before tax. This supposes that the measures of progressivity should either implicitly or explicitly be based on some of the inequality measures.

The most often used progressivity measures that are based on the Gini coefficient have been named after their inventors, that is Musgrave and Thin, Kakwani and Suits (1948).

Musgrave and Thin have developed a measure they called 'effective progression', which is defined as:

$$EP = \frac{1-G^a}{1-G^b} \tag{5}$$

where G^a is the Gini coefficient of income after tax, and G^b is the Gini coefficient of income before tax. According to this measure, a tax is progressive when EP>1, proportional when EP=1 and regressive when EP<1.

Kakwani (1976) has developed a progressivity index that he called P, and which was defined as:

$$P = C_t - G^b, \quad (6)$$

where G^b is the Gini coefficient of income before tax and C_t is the Gini coefficient of tax. According to this measure, a tax is progressive when P>0, proportional when P=0 and regressive when P<0.

Suits (1977) proposed a measure that has been used in several research projects. Suits' index is based on the calculation of Gini coefficient of a curve showing cumulative tax distribution on the vertical axis and cumulative income distribution on the horizontal axis. According to this measure, a tax is progressive when the relative concentration of a tax curve in respect to income is concave, i.e. when the index S>0. A tax is proportional when S=0, and it is regressive when S<0.

Although all three progressivity measures are based on the concept of Gini coefficient, each of them may produce a different result. According to one measure, a country may have a progressive income tax, while according to the second measure the same country may have a proportional income tax. Economists in general agree that there is no fully reliable progressivity measure in place and that one should always keep in mind all restrictions of the used measure (Ebert, 1992).

In absence of a study of the Gini coefficients, it is possible to measure progressivity by applying the total tax elasticity method. This method has been applied in this study as well.

Before the analysis of the Croatian data on income tax progressivity we have to stress that we accepted the assumption that income tax burden is borne by employees. Many research have primarily shown that the labour supply is relatively inelastic to changes in salary levels, which means that income tax burden will almost completely shift to employees (Musgrave and Musgrave, 1993; Shah and Whalley, 1990; Baumol and Blinder, 1991; Slemrod and Bakija, 1996; Rosen, 1999). Almost all these studies of income tax progressivity start from the assumption that the income tax is eventually borne by employees. That is why this research paper also assumes that the final wage income tax burden in Croatia is borne by employees.

Income Tax Progressivity in Croatia During the 1995 – 2002 Period

Introduction

The first tax reform that was implemented in Croatia after the independence in 1994 has significantly modernised and simplified the taxation of income. The reform introduced a concept of taxation of the total income, which was taxed with two rates of 25 and 35 percent. However, capital gains, dividends and interests were not subject to tax. Although the Croatian tax system had not experienced any significant structural

changes until 2001, the income taxation underwent certain modifications: personal allowances were increased from HRK 300 in 1994 to HRK 1,250 in 2000, new tax exemptions for certain categories of taxpayers (military invalids, areas of special state concern, artists and sportsmen) were introduced after 1996, the lower marginal tax rate was reduced from 25 to 20 percent in 1997, while personal allowance coefficients for dependent family members were progressively increased at the beginning of 1999.

In 2001 the Croatian tax system underwent a major reform: three tax rates were introduced (15, 25 and 35 percent), for the first time dividends and shares in profit were taxed, premiums for life insurance, additional health insurance, as well as voluntary pension insurance were partly regarded as personal allowances. Capital gains, interest and social security benefits were still not taxed. Craftsmen were allowed to deduct the salaries of the newly employed staff from the tax base.[1]

The analysis that follows will evaluate the impact of all these changes of the income tax system on the tax burden of different income brackets and categories of taxpayers, as well as the development of total income tax progressivity.

Progressivity Calculation Methods and Statistical Database

We have applied the concepts of the average tax rate and the tax elasticity in the calculation of tax progressivity conducted for the purpose of this study.

There are two types of tax elasticity that have been used in this research: the arc elasticity measured by a discrete function and the constant elasticity measured by a differential function. Both methods produce very similar results.

Estimate of the total tax elasticity indicates the level of progressivity of the overall income taxation system. The total elasticity of tax revenues E(Y) can also be calculated as the sum of individual elasticities by income brackets weighted by the share of tax liabilities of an income bracket in the total taxes:

$$E(Y) = \sum_{i=1}^{n} * e(y)_i * \frac{t_i}{T}, \tag{7}$$

where n is the total number of taxpayers, $e(y)_i$ tax elasticity of income bracket i, t_i tax paid from income bracket i, T total taxes.

In the course of our research we have used the Tax Administration Central Office data collected from the employee and pensioner tax-card forms (PK1) and annual tax returns of craftsmen. These data contain information on gross salaries, tax allowances and taxes of all employees employed with legal entities and physical persons, institutions, associations and state administration bodies. It is important to stress that these data provide information only on employee's contributions and do not show the

employer's contribution figures. The data show a calculated tax liability for a certain fiscal year, which in Croatia corresponds to a calendar year.

Data on income, contributions and taxes of the employees and pensioners are calculated or assumed data, received from the tax-cards forms for a particular fiscal year, regardless of whether payments have in the meantime actually occurred or not. There are several constraints with regards to the employment and pension income data:

1. Pensioners are exempted from payments of social security contributions;
2. Non-payment of the income tax and employee's contributions has not been registered in the calculated/assumed figures, thus suggesting that the effective tax burden is lower than the analysed results are showing it;
3. Tax allowances for premiums for life insurance, additional health insurance, as well as voluntary pension insurance for the employees are only partly included in the analysis because they are mostly reported in the annual tax return and are only rarely withheld from the employees salary and shown in tax-card forms;
4. Additional income from self-employment (author honorarium, supervisory board membership compensations, etc.), and other types of income (such as income from property) are not registered in the tax-card forms, but only in the taxpayers' annual tax returns. Due to the exclusion of such income, the progressivity analysis is incomplete, although the income from employment has got the highest share in the registered taxable income (together with pensions, its share has reached approximately 84 percent in 2002);
5. Except of the mentioned data constraints, the progressivity calculation accuracy is also conditioned by the widespread practice of registering employees at the lowest base for the calculation of social security contributions (colloquially called the minimum wage), while the difference until the real wage is paid out in cash.

Taxes of craftsmen denote a tax calculated in accordance with the annual income tax return. There are at least three reasons why the analysis of progressivity conducted on the basis of these data is partially questionable:

1. Income of craftsmen is already reduced by all expenses the law allows to be incurred in connection with generating such income;
2. With regard to craftsmen, the Tax Administration maintains only the records of calculated taxes, leaving out the contributions;
3. The law stipulates that craftsmen may pay contributions calculated on the minimum social security contribution base regardless of the level of their actual income, which makes them different from the employees, who in principal cannot

choose a social security contribution calculation base. A possibility to pay contributions calculated on the minimum contribution base makes the contributions of craftsmen a regressive type of tax and reduces the effective tax burden of their income.

The available data include the total gross income generated through salaries, pensions and the gross income of craftsmen, as well as income tax and surtax liabilities of employees, pensioners and craftsmen collected by the central government budget and the local administration and self-administration units. The data are presented in nominal amounts and have not been corrected for inflation. All the data have been grouped into 28 income brackets and categorised in line with the average monthly net income of taxpayers. The number of taxpayers has been provided for each income bracket. Years 1995 to 2002 were selected as reference years, while the unit of observation is an income bracket.

Result Analysis

Taxpayers, Income and Income Tax Structure

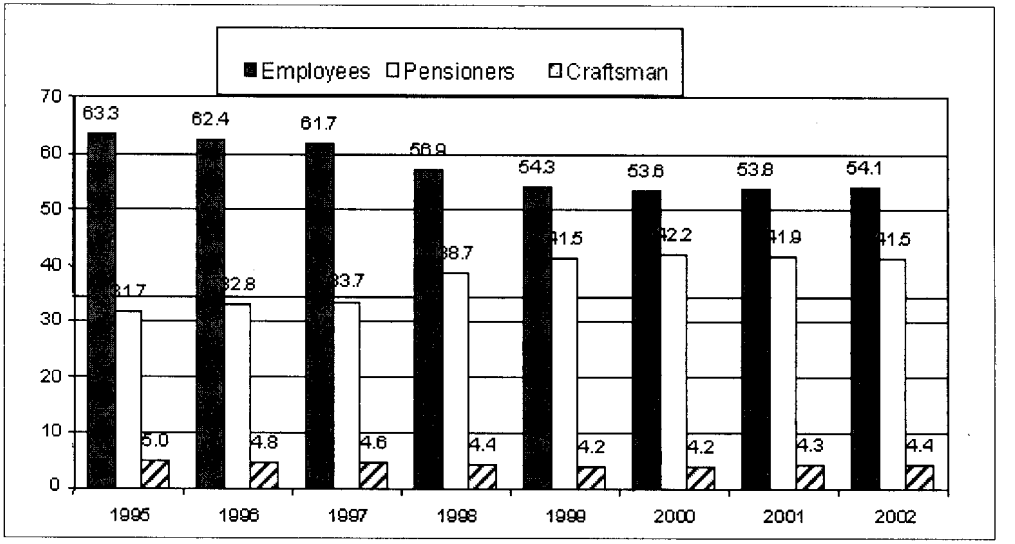
The total number of taxpayers increased by 26.9 percent in the period between 1995 and 2002. The number of employees grew by 8.4 percent, the number of craftsmen increased by 11.2 percent, while the total number of pensioners escalated by 66.2 percent. The average annual gross income per taxpayer has over the same period increased by 67.5 percent (employees 81.4 percent, pensioners 109.3 percent and craftsmen 30.7 percent). Such a progressive increase in the number of pensioners has resulted in changes in the taxpayer structure. Namely, the structure of taxpayers has modified in such way that employees have reduced their share from 63.3 percent in 1995 to 54.1 percent in 2002, while the share of pensioners has increased from 31.7 percent in 1995 to 41.5 percent in 2002. As a result, the number of pensioners has come 'dangerously' close to the number of employees. The share of craftsmen has at the same time decreased from 5.0 to 4.4 percent.

Table 1: Number of Taxpayers and Average Annual Gross Income

	Number of Taxpayers				Average Annual Gross Income (HRK)			
	Total	Employees	Pensioners	Craftsmen	Total	Employees	Pensioners	Craftsmen
1995	1,952,981	1,236,742	618,499	97,740	21,960	27,674	8,970	31,859
1996	2,003,475	1,250,043	657,728	95,704	24,386	31,475	9,384	34,891
1997	2,053,272	1,266,134	692,295	94,843	28,109	35,618	12,919	38,749
1998	2,284,101	1,300,477	884,186	99,438	29,301	39,350	13,782	35,865

1999	2,354,135	1,277,605	977,324	99,206	30,521	42,587	14,470	33,250
2000	2,367,931	1,268,498	998,936	100,497	32,973	46,457	15,479	36,653
2001	2,413,343	1,298,407	1,010,873	104,063	35,160	48,006	18,163	39,983
2002	2,477,381	1,340,988	1,027,660	108,733	36,783	50,191	18,772	41,650

Figure 1: Distribution of Taxpayers, (in %)



The total annual gross employment income bill was 6.2 times greater than the total gross pension bill in 1995, while in 2002 it was only 3.5 times higher. This means that the social security contribution rate should be two times higher in order to return the system into the zone of low fiscal deficit as it was in 1995. The trend of reduction in the rate of coverage of pensions with the wage bill was finally stopped in 2002 (from 3.4 in 2001 to 3.5 in 2002), mostly for two reasons: bigger increase of the number of employees than that of pensioners, and faster growth of average income of employees (4.6 percent) than that of pensioners (3.4 percent).

Average reported gross annual income of craftsmen has increased by as much as 4.2 percent in 2002. This change could be connected with an increased economic activity of craftsmen on one hand, and the need to improve quality of their financial book-keeping and reporting in order to qualify for loans that are being offered to craftsmen at much more favourable conditions since 2000 on the other hand.

While employees contributed 73.9 percent to the total gross income in 2002, their share in the total taxes, surtaxes and contributions has exceeded 97.9 percent. The tax burden of pensions is almost insignificant, taking into account the fact that the share of pensions in the total gross income was 21.6 percent in 2002, while at the same time only 1.1 percent of the total income tax has been collected from pensions, which is on

average HRK 222 a year per pensioner in 2002. Even this is a major increase from the average of HRK 71 in 2000 and is a result of the 18 percent, on average, increase of pensions in 2001 as a Government attempt to repay the debt to pensioners stemming from the 1993 Stabilization Program.

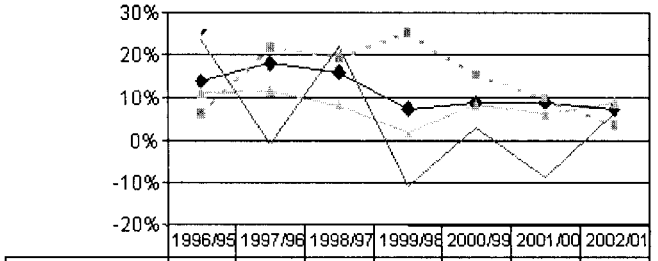
Table 2: Yearly Income and Tax Distributions

	Total Income Distribution				Distribution of Income Tax and Contributions			
	Total	Employees	Pensioners	Craftsmen	Total	Employees	Pensioners	Craftsmen
1995	100	79.80	12.94	7.26	100	94.58	0.09	5.33
1996	100	80.53	12.63	6.83	100	94.81	0.09	5.10
1997	100	78.14	15.50	6.37	100	95.04	0.28	4.68
1998	100	76.46	18.21	5.33	100	95.63	0.42	3.96
1999	100	75.73	19.68	4.59	100	97.05	0.28	2.67
2000	100	75.48	19.80	4.72	100	96.42	0.38	3.20
2001	100	73.46	21.64	4.90	100	95.63	1.21	3.16
2002	100	73.86	21.17	4.97	100	97.93	1.11	0.96

The total gross income of all three observed taxpayer categories has over the 1995-2002 period increased by 112.5 percent, while the same period recorded an increase in collected taxes and contributions of only 56.2 percent. Contributions grew at faster rate (70.7 percent) than taxes and surtaxes (33.4 percent) because no tax reliefs are applied to contributions. A difference between the rate of increase in collected taxes and contributions on one hand, and the rate of increase in gross income, on the other hand, is the result of multiple increases in personal allowances, the reduction of lower marginal tax rate (which occurred in the beginning of 1997 and 2001) and elimination of the child benefit contribution (mid-1998). Personal allowances grew by 154.6 percent amid the increase in tax allowances and coefficients for dependent family members (the largest such increase was recorded in 1999) but also due to new tax relives introduced in 2001. An increase in personal allowances from 1,000 to HRK 1,250 for individual taxpayers resulted in the increase in total personal allowances by 15.3 percent in 2000 only. Decreasing of the lower marginal tax rate and introduction of a third rate in 2001 resulted in a reduction of taxes and surtaxes by 8.6 percent.

If we focus our analysis on employees, the taxes and contributions they have paid during the observed period increased by 61.7, while craftsmen have paid 72 percent less taxes in 2002 than in 1995. Obviously they made an advantage of the stipulated tax allowances, which in the same period increased by 177.4 percent. The tax allowances of employees increased by 122.4 percent, and those of pensioners were 227.9 percent higher in 2002 than in 1995.

Figure 2: Annual Growth Rates, All Taxpayers



	1996/95	1997/96	1998/97	1999/98	2000/99	2001/00	2002/01
Gross In.	13.9%	18.1%	16.0%	7.4%	8.7%	8.7%	7.4%
Per. Deduct.	6.2%	21.6%	19.3%	25.2%	15.3%	9.8%	3.4%
Contrib.	11.3%	11.6%	8.2%	1.4%	8.4%	6.2%	8.7%
Income Tax	23.5%	-1.2%	22.2%	-10.6%	3.0%	-8.6%	6.3%

The distribution of taxpayers within income brackets points at frequent use of the institute of the minimum base for payment of social security contributions as the minimum wage. Although the share of taxpayers who reported income below such a minimum base has been reduced in comparison with 2001, in 2002 some 38.0 percent of taxpayers still reported a monthly income that was below the minimum base, which amounted to HRK 1,700, and HRK 1,800 from April 2002. The share of craftsmen who reported monthly income below the minimum base was as high as 37.5 percent, while the share of employees with an average reported monthly income below HRK 1,700 (HRK 1,800) was 18.7 percent. There is no doubt that such a high share of craftsmen with monthly income below the minimum wage points at very large tax evasion by those taxpayers. The fact that 64.0 percent of pensioners received a monthly pension below HRK 1,700 in 2001, however, significantly contributed to such high share of taxpayers with a gross monthly income below HRK 1,700. For comparison, in 2000, before the rise of pensions, 79.9 percent of pensioners received a monthly pension below HRK 1,700.

Some 31.2 percent of the total taxes, surtaxes and contributions were collected from taxpayers whose income fitted into such low income brackets in 1995, while the share of the taxes and contributions collected from taxpayers from those income brackets reached only 4.1 percent in 2002. As much as 42 percent of the total gross income in 1995 was paid out on monthly income lower than HRK 1,700, while this share was reduced to 12.6 percent in 2002. Expectations that the income scale distribution of taxpayers would face significant changes during 2002, when the system of capitalized pension savings was introduced had not come truth. Since the system of capitalised pension savings is a system of personal savings for old age, which is also guaranteed by the Government, it is assumed that it would motivate the self-employed workers to pay contributions calculated on the amounts that would be

higher than the minimum base for the calculation of social security contributions, while employees would be motivated to better negotiate and control their salaries on which the employers pay contributions. The compliance effects of the introduction of the second pillar pension insurance did not meet the expectations (were not visible in the payment of contributions).

Average Tax Burden

A very high personal allowance for pensions has resulted in extremely low income tax payments by pensioners. At the same time, an average annual amount of income taxes and contributions reached around HRK 14,964 per employee in 2002 what makes an increase of HRK 978 comparing to the previous year. A decrease in the average amount of taxes paid by craftsmen of HRK 1,802 or nearly HRK 4,000 less than in 2001 is noticeable. Since there were no changes in the social security contribution rates in 2002, the average contribution burden of income of employees has remained at the level of 20.3 percent.

The average tax burden of the overall income (including taxes, surtaxes and contributions) reduced from 30.6 percent in 1995 to 22.5 percent in 2002, which is a decrease of as much as 26.5 percent. The reduction in the income tax burden measured by the reduction in taxes and surtaxes is even larger and amounts to 37.2 percent, while the average tax rate was reduced to below 7.5 percent in 2002. The reduction of taxes in the period 1995-2002 resulted in an increase of net income of all taxpayers: employees by 99.7 percent, pensioners by 107.2 percent and craftsmen by 51.1 percent.

Figure 3: Average Income Tax and Contribution Burden of Income, All Taxpayers, (in %)

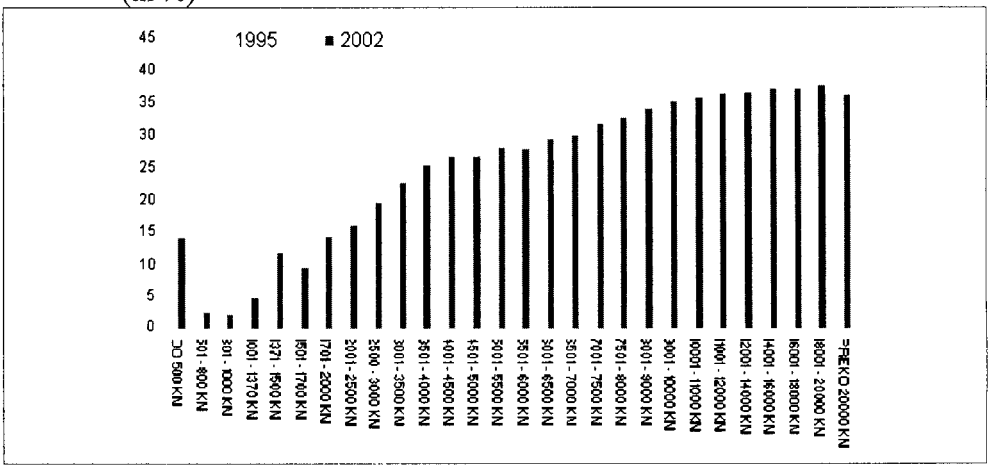
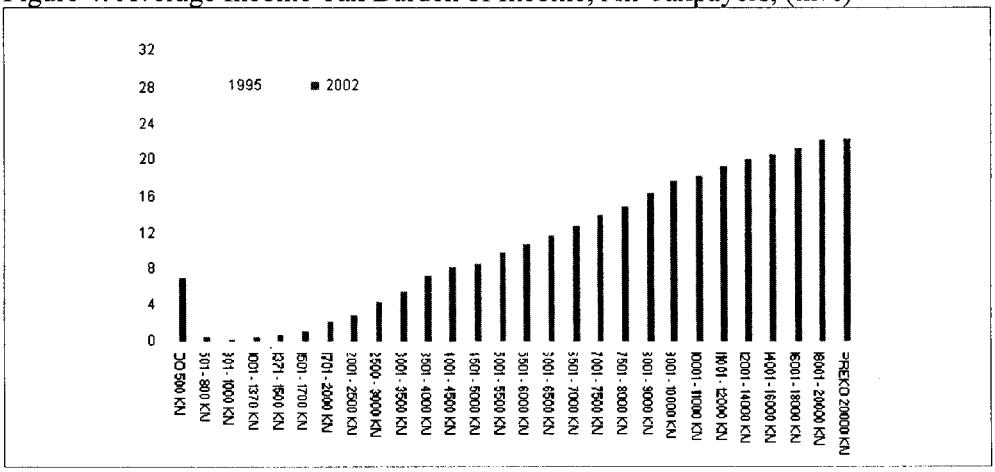


Figure 4: Average Income Tax Burden of Income, All Taxpayers, (in%)



After the calculation of the average tax rates by income brackets, we came to a conclusion that the average tax burden increases in higher income brackets, which is equivalent to the statement that the income taxation system is progressive. The highest average tax burden is for the income brackets over HRK 18,000 to 20,000 - i.e. 37.6 and 22.2 percent (without contributions). Once we calculated the total tax burden excluding contributions, we realised that the average tax burden curve has got an even steeper slope as it rises towards higher income brackets. By comparing the total tax burden with the tax burden excluding contributions, we can make a conclusion that contributions reduce the progressivity of the income tax.

A reduction in the total tax burden was recorded in 25 out of 28 income brackets within the observed period. When comparing the 2002 to 1995 figures, the average tax burden (including contributions) increased in all income brackets exceeding HRK 18,000. But if we compare 2002 to 2001 than the biggest decrease of tax burden was for income over HRK 10,000, and especially over HRK 20,000. This confirms the view that the income tax system favors high incomes by decreasing their average tax burden. This is especially true for the employment incomes.

The average tax burden of employment income has been reduced by 17.8 percent over the observed period. If we exclude contributions from the analysis (Table 4), the rate of reduction is 26.1 percent. The tax and contribution burden of income has been reduced in as many as 24 income brackets, while the tax burden of income exceeding HRK 16,000 has been increased. A significant reduction in the average tax burden was recorded in 1997, following the reduction in marginal income tax rate from 25 to 20 percent. The average tax burden experienced a significant reduction again at the beginning of 1999 when it was reduced by 2-3 percentage points. The decrease in the average tax burden occurred because of the increase in personal allowances from

HRK 800 to HRK 1,000 and the progressive increase in personal allowance coefficients for dependent family members. The tax burden was additionally reduced in 2000. The introduction of the lower marginal tax rate of 15 percent in 2001 contributed to a reduction of the tax burden by two percentage points. But, during 2002, an increase of the tax burden is noticeable because of the increase of salaries (more than 7 percent) in the conditions of an unchanged tax system.

The tax burden of low-income brackets has been increased. Such trend could be explained by the contribution payment obligation on even such low income, which makes the system of taxation of the lowest income very regressive. The tax burden in the highest income brackets has increased more slowly. Table 5 confirms a theory of regressivity of contributions levied on lower-level income. Comparing to 2001, the contribution burden has in 2002 increased only moderately which is the consequence of an increase of the minimum base for payment of contributions in April 2002 from HRK 1,700 to 1,800.

Table 5: Average Contribution Burden of Income of Employees

Income Brackets (in HRK)	Average Contribution Burden of Income (%)								ATR Change (in %)	
	1995	1996	1997	1998	1999	2000	2001	2002	2002/ 1995	2002/ 2001
Below 500	23.6	35.8	25.9	26.3	24.2	24.3	23.6	28.9	22.7%	22.5%
501 - 800	23.5	23.7	23.0	22.6	21.2	20.9	21.3	22.2	-5.4%	4.2%
801 – 1000	23.6	23.7	22.8	21.9	20.7	20.6	20.9	21.3	-10.0%	1.7%
1001 - 1370	23.6	23.2	22.7	21.7	20.6	20.6	20.6	20.8	-12.2%	0.6%
1371 - 1500	23.7	23.0	22.6	21.6	20.4	20.4	20.5	20.6	-13.0%	0.2%
1501 - 1700	23.7	23.1	22.5	21.4	20.5	20.5	20.4	20.6	-12.9%	1.1%
1701 - 2000	23.7	23.1	22.5	21.4	20.4	20.4	20.5	20.6	-13.1%	0.2%
2001 - 2500	23.7	23.0	22.5	21.4	20.3	20.2	20.4	20.5	-13.5%	0.7%
2500 - 3000	23.2	22.7	22.4	21.4	20.4	20.3	20.4	20.5	-11.8%	0.5%
3001 - 3500	23.0	21.6	21.7	21.0	20.2	20.3	20.4	20.5	-11.2%	0.4%
3501 - 4000	22.8	22.0	21.5	20.6	19.9	20.0	20.1	20.2	-11.3%	0.9%
4001 - 4500	22.6	21.3	21.5	20.7	19.9	20.0	20.1	20.2	-10.8%	0.8%
4501 - 5000	22.6	21.3	21.3	20.6	19.8	20.0	20.1	20.3	-10.0%	0.9%
5001 - 5500	22.3	21.4	21.4	20.7	19.8	20.0	20.1	20.3	-9.0%	1.0%
5501 - 6000	22.3	21.1	21.3	20.6	19.9	19.9	19.9	20.2	-9.5%	1.3%
6001 - 6500	22.3	21.1	21.2	20.6	19.8	19.9	20.0	20.2	-9.3%	1.3%
6501 - 7000	22.2	21.0	21.4	20.7	19.8	19.9	20.1	20.2	-8.8%	0.7%
7001 - 7500	22.5	21.6	21.2	20.7	20.0	20.0	20.2	20.3	-9.6%	0.6%
7501 - 8000	22.5	21.4	21.1	20.6	19.8	19.9	20.3	20.4	-9.1%	0.6%
8001 - 9000	22.2	21.3	21.3	20.6	19.8	20.0	20.4	20.4	-7.8%	0.4%

9001 – 10000	21.0	21.2	20.9	20.3	19.9	20.0	20.3	20.4	-3.0%	0.4%
10001 - 11000	20.6	21.4	21.1	20.0	19.8	20.1	20.3	20.3	-1.5%	0.3%
11001 - 12000	20.3	21.0	21.0	20.4	19.7	20.0	20.1	20.2	-0.8%	0.3%
12001 - 14000	20.4	20.3	21.2	19.9	19.5	19.9	19.8	20.1	-1.6%	1.2%
14001 - 16000	19.1	19.7	20.2	19.8	19.5	19.7	19.9	20.1	5.3%	1.1%
16001 - 18000	20.4	18.9	19.8	19.0	19.6	19.5	19.4	19.8	-2.9%	1.8%
18001 - 20000	20.5	19.8	19.3	19.2	19.4	19.3	19.3	19.5	-4.8%	1.0%
More than 20000	20.5	21.4	19.1	19.3	18.7	18.4	18.7	19.2	-6.3%	2.6%
TOTAL	23.4	22.7	22.1	21.1	20.1	20.1	20.2	20.3	-13.2%	0.7%

Therefore, if we take a look at changes in the average tax burden, which grows with an increase in income, we can say that the progressivity of income taxation has been increased in the period between 1995 and 2001, but decreased in 2002. So, the income tax system is still progressive, but the level of its progressivity has decreased. The inclusion of contributions into the analysis, however, reduces the progressivity of the system, since flat-rate contributions are imposed almost proportionally on all levels of income. Moreover, the system turns regressive in income brackets that are below the minimum base for social security payments.

Tax Elasticity

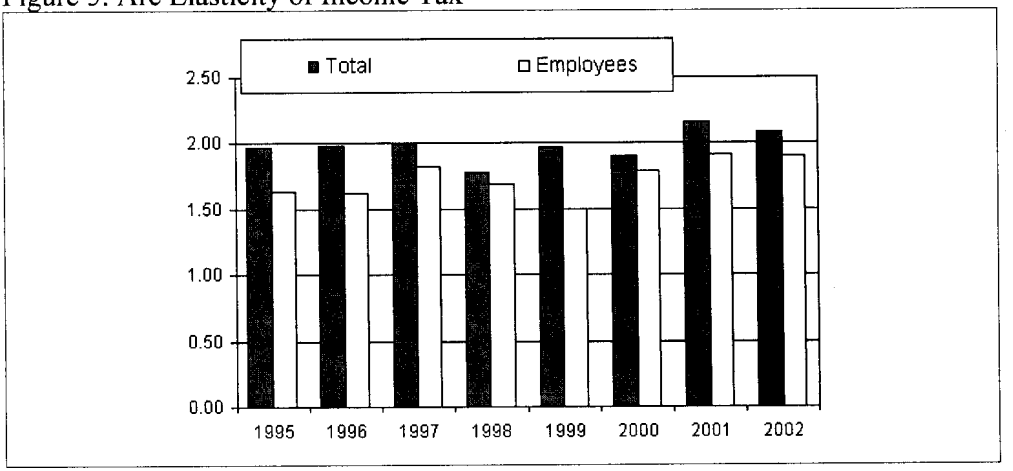
We have calculated the constant elasticity on the assumption that the elasticity did not change significantly between two nearest income brackets. As a result of such assumption, the tax elasticity of income brackets with the highest share in the total taxes will have the largest impact on the total tax elasticity. Although a use of constant elasticity holds some drawbacks, it is still the most widely used method of estimation of progressivity of different tax systems of OECD countries. The arc tax elasticity produces different results, but still points at the same trends.[2]

Contributions have been excluded from the calculation of tax elasticity since the data on contributions of craftsmen are not available. We can make a conclusion from the available data that the overall tax system has remained highly progressive in 2002, although the total progressivity has been reduced in comparison with 2001. Tax elasticity of the employees remains unchanged.

From the analysis of tax elasticity of employees it can be seen that the tax elasticity of employees is significantly lower than the total tax elasticity of all taxpayers. A difference between the two elasticities can be explained by the fact that tax relieves of pensioners are twice as high as those of employees and that they are exempted from contribution payments, as well as by significant statutory provisions allowing craftsmen to reduce their tax liability and social security contribution

payments. The distribution of the total tax burden (including pensioners and craftsmen) is, therefore, more progressive than the distribution of the tax burden of employees.

Figure 5: Arc Elasticity of Income Tax



If we look at the trends in tax elasticity by individual tax brackets, we can see that the progressivity of the tax system was reduced in 2002 in comparison with 1995 in 6 income brackets, and that the system has been regressive in two income brackets. Nevertheless, it is worrisome that the tax elasticity has been increased in low and mid-income brackets, and reduced in high-income brackets exceeding HRK 9,000. Such trend implies that the income tax progressivity could be reduced over time if the future increase in income was recording a disproportional increase only in high-income brackets. The tax elasticity tends to reduce with an increase in income, and the lowest tax elasticities can be found in the highest income brackets. The tax elasticity gets reduced as we move along the income brackets, and again sharply rises at the level of income on which the marginal tax rate increases.

Table 6: Tax Elasticity – All Taxpayers

Income Brackets (in HRK)	Elasticity of Income Tax - Constant Elasticity								Elasticity of Income Tax - Arc Elasticity							
	1995	1996	1997	1998	1999	2000	2001	2002	1995	1996	1997	1998	1999	2000	2001	2002
Below 500	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
501 - 800	0.93	-0.67	-0.55	-0.31	-0.35	-0.34	-0.15	-0.36	0.89	-0.32	-0.25	-0.15	-0.12	-0.11	-0.05	-0.10
801 - 1000	1.57	2.61	3.36	3.24	2.02	1.47	-1.36	-0.79	1.76	3.65	5.28	4.80	2.37	1.60	-0.94	-0.59
1001 - 1370	2.69	3.55	2.96	3.59	4.12	4.15	2.17	2.69	3.86	6.19	4.46	6.07	7.67	6.93	2.60	3.36

1371 - 1500	2.09	2.17	2.48	2.82	3.85	2.19	4.08	3.04	2.46	2.60	3.01	3.55	5.35	2.54	5.72	4.05
1501 - 1700	1.88	1.90	2.42	2.62	3.90	6.78	2.76	3.19	2.02	2.04	2.67	2.97	4.96	10.45	3.09	3.64
1701 - 2000	1.73	1.76	2.34	2.14	2.06	3.15	3.99	4.25	1.86	1.92	2.73	2.39	2.29	3.93	5.55	5.94
2001 - 2500	1.66	1.59	1.91	2.02	2.20	2.20	2.50	2.33	1.79	1.71	2.17	2.35	2.58	2.58	3.00	2.75
2500 - 3000	1.81	1.70	1.78	1.84	1.98	2.20	2.51	2.54	2.00	1.85	1.98	2.10	2.29	2.61	3.10	3.15
3001 - 3500	1.63	1.84	1.93	1.80	1.82	1.94	2.19	2.10	1.73	1.99	2.12	1.96	2.00	2.17	2.52	2.40
3501 - 4000	1.48	1.35	1.87	1.79	1.80	1.67	2.15	2.21	1.53	1.38	2.01	1.91	1.93	1.79	2.41	2.51
4001 - 4500	1.49	1.45	1.66	1.71	1.59	1.61	1.77	1.75	1.53	1.49	1.74	1.80	1.66	1.68	1.88	1.85
4501 - 5000	1.47	1.17	1.57	1.52	1.82	1.67	1.66	1.59	1.51	1.18	1.62	1.57	1.91	1.74	1.72	1.65
5001 - 5500	1.25	1.34	1.55	1.16	1.75	1.88	2.18	1.99	1.26	1.36	1.61	1.17	1.80	1.97	2.33	2.11
5501 - 6000	1.46	1.28	0.84	0.78	1.55	1.81	1.96	2.04	1.48	1.30	0.83	0.77	1.59	1.88	2.05	2.14
6001 - 6500	1.73	0.96	-0.53	-6.44	-0.82	2.07	2.23	1.82	1.77	0.95	-0.52	-6.13	-0.78	2.19	2.36	1.90
6501 - 7000	1.23	1.83	1.78	1.82	2.50	-4.79	1.78	1.93	1.24	1.88	1.84	1.94	2.74	-4.55	1.84	2.00
7001 - 7500	1.86	1.43	1.70	2.19	1.97	2.48	2.06	2.04	1.93	1.45	1.76	2.35	2.07	2.74	2.18	2.14
7501 - 8000	1.30	3.18	-0.21	-1.73	-0.27	1.71	2.02	1.83	1.31	3.20	-0.21	-1.67	-0.27	1.76	2.10	1.90
8001 - 9000	1.33	1.66	2.08	1.82	1.97	1.93	1.87	1.84	1.35	1.72	2.23	1.90	2.11	2.07	1.97	1.92
9001 – 10000	1.88	1.69	1.59	1.78	2.00	1.55	1.75	1.70	1.91	1.74	1.64	1.87	2.07	1.61	1.84	1.77
10001 - 11000	1.61	1.30	3.55	1.59	1.44	1.64	1.58	1.33	1.63	1.33	3.66	1.64	1.50	1.69	1.63	1.36
11001 - 12000	1.86	1.07	1.41	1.53	1.61	1.47	1.51	1.59	1.88	1.08	1.44	1.56	1.63	1.51	1.54	1.64
12001 - 14000	1.12	2.23	1.45	1.55	2.09	1.44	1.56	1.33	1.12	2.25	1.47	1.57	2.11	1.46	1.60	1.35
14001 - 16000	1.08	1.25	1.45	1.19	1.40	2.04	1.52	1.28	1.09	1.27	1.47	1.21	1.43	2.09	1.57	1.31
16001 - 18000	6.73	1.33	1.19	0.19	1.21	1.25	1.57	1.24	6.66	1.34	1.21	0.20	1.23	1.27	1.60	1.26
18001 - 20000	13.85	0.52	1.26	1.80	0.76	2.51	1.22	1.55	13.95	0.51	1.28	1.78	0.76	2.55	1.24	1.58
More than 20000	0.99	1.09	1.06	1.11	1.13	0.75	1.30	1.02	0.99	1.11	1.07	1.14	1.14	0.76	1.39	1.03
TOTAL	1.77	1.72	1.78	1.55	1.76	1.69	1.96	1.89	1.97	1.99	1.99	1.78	1.97	1.91	2.16	2.08

The introduction of tax allowances for insurance premiums and the increase of the minimum base for contribution payments stopped the decrease of progressivity of employees. However, the intention of these measures was completely opposite. The elasticity of taxes and surtaxes imposed on employees was reduced over the observed period from a very high 1.83 in 1997 to 1.49 in 1999, before increasing to 1.91 in 2001/02. The tax measures resulted in an increase in elasticity of taxes and contributions in 2002 (1.25). The elasticity of taxes and contributions was slightly higher than in 1997 (1.22), which was the most progressive year up to then.

Figure 6: Elasticity of Contributions – Employees

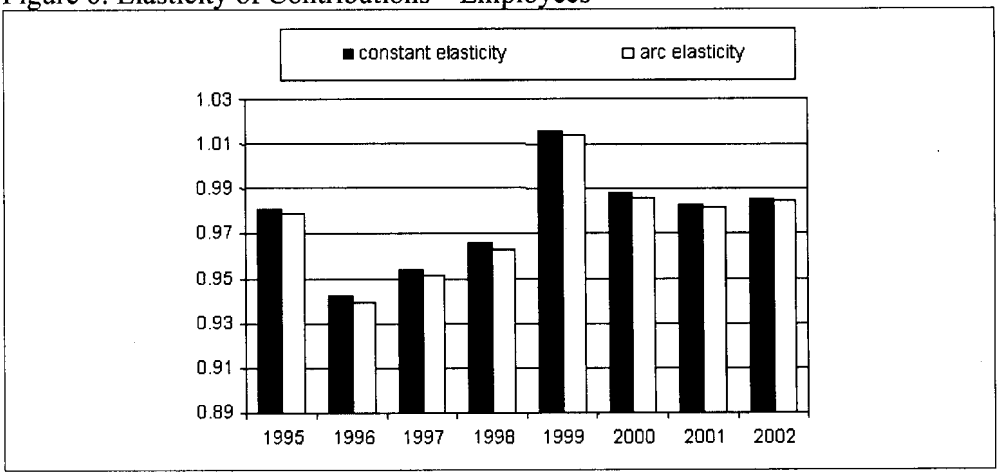


Table 8: Tax Elasticity in Selected Countries

Country	Year	Tax Elasticity
Australia	1979/80	1.67
Austria	1976	1.75
Belgium	1977	1.67
Canada	1979	1.65
Denmark	1980	1.52
Finland	1979	2.34
Germany	1978	1.64
Greece	1979	1.86
Ireland	1979/80	1.76
Japan	1980	1.88
Netherlands	1975	1.73
New Zealand	1976	1.83
Norway	1979	2.41
Sweden	1979	2.33
USA	1980	1.55
Croatia	**2002**	**2.08**

Source: OECD (1984).

Tax elasticity has increased in the middle-income brackets (from HRK 3,501 to 6,500), and is decreased in low (up to HRK 1,500) and high income brackets (Table 7). Elasticity of contributions is always near to one, i.e. close to proportional elasticity. In income brackets below HRK 1,000 and more than HRK 16,000 the

contribution system is more regressive and thus influence the total tax elasticity to move downwards.

If we compare the income tax elasticity in Croatia and in some other countries we can see that elasticity in Croatia is pretty high and is approaching that of Scandinavian counties. The general conclusion is that income tax in Croatia is highly progressive.

Conclusion

Since an income tax can be well adjusted to the financial capacity of a taxpayer, it is usual to use its progressivity to remedy a typical regressivity of the consumption tax. However, it is important to point out that there is no unambiguously defined optimal progressivity. All the economists can do is simply measure the progressivity of an income tax and indicate the ways on which it can be achieved.

There are different ways of measuring the progressivity of a certain tax or an overall tax system, which is primarily done by measuring changes in the average tax rate by income brackets or by applying the concept of tax elasticity. In addition, there are measures that use the Gini coefficient and have been named after their inventors, such as Musgrave and Thin, or Kakwani and Suits. In order to measure progressivity of the income tax in Croatia in the period 1995 – 2000, we have selected to (i) research changes in the average tax rate and (ii) use the method of tax elasticity.

The results of our research are showing that the average tax and social security contribution burden of income has reduced in the 1995 – 2002 period. The average income tax and social security contribution burden of all taxpayers has reduced from 30.6 percent to 22.5 percent during the 1995 – 2002 period, while the burden of the income tax itself has fallen from 11.9 percent to 7.5 percent. The same trend has been noticed with regards to employees.

Progressivity measured by the total tax elasticity of the whole income scale indicates that the income tax system is very progressive for all taxpayers. The average arc elasticity of income tax for all taxpayers amounts to 1.98 in the observed period. Following a 1998 decrease (1.78), the progressivity increased again and reached 2.08 in 2002. In comparison with developed countries, income tax in Croatia is highly progressive.

The introduction of social security contributions into the analysis increases the tax burden, but reduces the progressivity of the system, because contributions burden all levels of income almost proportionallywith a single rate. Moreover, the system turns regressive in income brackets below the minimum social insurance base. The distribution of the total tax burden (including employees, pensioners and craftsmen)

is more progressive than the distribution of the tax burden of employees, suggesting higher tax relieves and lower tax burden for pensioners and craftsmen.

The progressivity trend over the individual income brackets suggests that the income tax progressivity could be reduced over time if the future increase in income was recording a disproportional increase only in high-income brackets. The tax elasticity tends to reduce with an increase in income, and the lowest tax elasticities can be found in the highest income brackets. The tax elasticity gets reduced as we move along the income brackets, and again sharply rises at the level of income on which the marginal tax rate increases.

NOTES

[1] At the end of 2002 the income tax system was once again changed. This change will have an impact on data for the year 2003.

[2] For the purpose of calculating the tax elasticity, the average income and average tax liability per taxpayer have been calculated for each income bracket. Moreover, a comparison of the increase in average income and the average tax liability between two income brackets has been conducted in order to calculate the tax elasticity for each tax bracket.

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