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## **DOES LABOUR TAXATION AFFECT UNEMPLOYMENT? CROATIAN WORKER IN INTERNATIONAL PERSPECTIVE**

### **ABSTRACT**

*The paper examines the issue of labour taxation of Croatian worker in comparison to workers in OECD and EU Member States. By using hierarchical cluster analysis it studies the relations between tax wedge and labour market outcomes, whereas with panel regression analysis, performed on data for 39 countries during 2000–2008 period, estimates the impact of tax wedge on unemployment rate. The empirical estimates show that Croatia classifies among countries with higher unemployment and lower employment rate, characterized with higher tax wedge. Furthermore, the estimates of the regression analysis showed that the tax wedge at all three wage levels (i.e. 67 %, 100 % and 167 % of average wage) has a significant positive impact on unemployment rate. This signifies that Croatia, as other studied countries, should continue with reduction of tax wedge, as this would alleviate unemployment problems and stimulate job creation.*

**Key words:** tax wedge, labour costs, unemployment, economic policy, Croatia, OECD, EU.

**JEL classification:** J30, J38, H24.

### **1 INTRODUCTION**

The issue of labour taxation and its possible effects on labour market outcomes has been a subject of range of studies in recent years. Several studies find that a decline in tax wedge may alleviate unemployment, stimulate job creation and by this affect employment and improve general economic performance. Namely, by creating a wedge between labour costs and real consumption net wage, taxes on labour in imperfectly flexible labour markets reduce demand for labour (if demand for labour is imperfectly inelastic) and employment and therefore increase unemployment (Vodopivec, 2005).

The main objective of this paper is to study the labour taxation and labour market outcomes (in terms of employment and unemployment rate) in Croatia from an international comparative perspective. Moreover, the paper deals with the relation between tax wedge and labour market performance in member countries of Organisation for Economic Co-operation and Development (OECD), European Union (EU) and Croatia, giving the latter a special attention. Most importantly, the paper tests the hypothesis whether and how taxes on labour influence unemployment rates in studied countries.

In order to explain the characteristics of taxes levied on labour and indicators of labour market performance we apply basic descriptive statistics. To identify groups of countries that are similar to each other with regard to employment and unemployment rate we use

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hierarchical cluster analysis (based on Ward's method and squared Euclidean distance). To study the impact of tax wedge on unemployment rate we employ panel regression analysis on the sample of 39 countries (i.e. OECD and EU Member States plus Croatia) for the period 2000–2008. We expect a positive association between labour taxation and unemployment rate.

The added value of this paper in comparison to previous studies on labour taxation in Croatia<sup>4</sup> is twofold. Firstly, we analyse the issue of taxation of Croatian worker in broader international comparative perspective, taking into account different levels of average wage and the latest available data. Secondly, we investigate the impact of labour taxation on unemployment, showing on the importance of reducing labour taxation for solving unemployment problems in Croatia.

The rest of the paper is organized in the following way. Section 2 gives a brief overview of previous empirical studies on the impact of labour taxation on labour market performance, followed by the presentation of data and methodology in Section 3. Section 4 presents basic statistics and trends in labour taxation in Croatia in comparative international perspective. Section 5 is devoted to classification of chosen countries into clusters using hierarchical cluster analysis. Section 6 tests causalities between labour taxation and unemployment using panel regression analysis. Section 7 concludes and gives relevant policy recommendations.

## **2 THEORETICAL BACKGROUND**

A simple theoretical framework of labour supply and demand presumes that an increase of tax wedge can be represented by a downward shift in the labour demand curve. The extent to which the tax wedge affects employment is highly dependent on the elasticities of the labour supply and demand curve, implying that the more elastic is the labour supply curve (and/or demand curve), the higher is the negative effect of tax wedge on employment (see Góra *et al.*, 2006).

Tax wedge-employment/unemployment relationship has been a subject of several macroeconomic empirical studies, mostly based on different panel datasets of countries. Despite differences in the structure of econometric models, the majority of studies pointed on the existence of a negative relationship between tax wedge and employment. The brief structure and results of these studies are summarized in de Haan *et al.* (2003), Nickell (2003) and OECD (2006). Yet, the extent to which an increase in tax wedge results in lower employment and/or higher unemployment appears to be affected by institutional features of the individual labour markets such as labour market flexibility, collective bargaining, regulations in the field of minimum wages and unemployment benefits, skill level of the labour force (Bertoncelj, 2010), tax incidence share and progressivity, wage formation structure, active and other labour market policies and institutions.

In one of the most cited studies, Nickell and Layard (1999) showed by using the panel analysis on 20 OECD countries between 1983–1994 that a decrease in average tax wedge (that includes payroll, income and consumption taxes) for 5 percentage points would reduce the unemployment rate by 13 %. Likewise in one of the following studies, Nickell (2003) reported that an increase in tax wedge by 10 percentage point would result in the reduction of labour input of the working age population by somewhere between 1 and 3 %. By comparing the big three countries of continental Europe (France, Germany and Italy) with the United States, Nickell (2003) also showed that the difference in tax wedge (around 16 percentage points) explains around one quarter of the overall difference in the employment rate. The

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<sup>4</sup> Some of the studies performed on the issue of labour taxation in Croatia are presented in Section 2.

remained difference could be explained by substantial differences in the social security system and in other labour market institutions.

Alesina and Perotti (1997) on the sample of 14 OECD countries empirically confirmed the theoretical model which showed that an increase in redistribution financed by an increase in labour taxes leads to an increase in the unit labour cost and therefore induces a loss of competitiveness causing a reduction in the demand for exports and a fall in employment (see Kavčič and Bertonec (2010) for a review some of these issues in Slovenian organizations).

On the other hand, Daveri and Tabellini (2000) showed that the negative effect of labour taxation on employment and growth is a European phenomenon (correlation is strong and evident in highly unionized countries of continental Europe and much less so in OECD countries with competitive labour markets and in the Scandinavian countries with highly centralized trade unions). Their empirical research on the sample of 14 OECD industrial countries during the 1965–1991 period has pointed that the rise of 10 percentage points in the rate of effective labour taxes can account for a 4 percentage points increase in European unemployment.

In the empirical study of Bassanini and Duval (2006) performed on the sample of 21 OECD countries during 1983 and 2003 it is shown that in the “average” OECD country, high and long-lasting unemployment benefits and high tax wedge increase aggregate unemployment and lower employment prospects. Namely, a 10 percentage points reduction of tax wedge would reduce equilibrium unemployment by 2.8 percentage points and increase the employment rate by a larger 3.7 percentage points (due to positive impact on participation). By contrast, highly centralized and/or coordinated wage bargaining systems are estimated to reduce unemployment.

Similar estimates of the impact of tax wedge on labour market performance were obtained in the studies based on the samples of EU Member States. For example, Góra *et al.* (2006) showed a negative effect of tax wedge on employment growth in eight New Member States (NMS) and provided evidence that tax wedge more strongly affects employment rates among low-skilled workers, but high-skilled are rather immune from this effect. A significant negative impact of higher tax wedge on labour force participation and employment rate (especially for elderly) in NMS-8 has been suggested also by Vörk *et al.* (2007). Their estimates obtained in the panel data analysis of eight NMS between 1996 and 2004 showed that a reduction of the tax wedge by 1 percentage point could increase employment rate by about 0.2–0.7 percentage points. A detrimental effect of high tax wedges and/or inappropriate benefits systems on the generation of desirable labour market outcomes (employment, unemployment and inactivity) on the sample of ten Central and Eastern EU Member States (CEE-10) was also shown in the study of Behar (2009).

Results are not much different for Croatia. For example, Grdović Gnip and Tomić (2010) and Šeparović (2009) with hierarchical cluster analysis showed that Croatia places itself among countries with high tax wedge, which are characterised with higher unemployment and lower employment rates. Also Urban (2009) concluded that Croatian tax wedge is very high in comparison to some of the OECD countries and that the long-term development of Croatia will depend on reducing the tax wedge and on other vital reforms. Similarly Nestić (1998) suggested that Croatia should lower the taxation of labour, however not to lower unemployment, but primarily to increase the competitiveness of Croatian economy and to reduce informal sector employment.

A brief review of the literature suggests that tax wedge has been one of the significant reasons for unemployment among countries. However, even the estimates of a negative impact of tax wedge on labour market outcomes may be relatively strong; they are subjected to criticism due to robustness of data and empirical model (see for example Blanchard, 2006).

### 3 METHODOLOGY AND DATA

In order to be comparable among countries, we base our analysis of labour taxation on the average tax wedge indicator calculated on the basis of OECD methodology (see OECD, 2008). The tax wedge is the ratio of total labour taxes to total labour costs as paid by an employer:

$$ATW = \frac{PIT + SSC_e + SSC_f + PT - CB}{w + PIT + SSC_e + SSC_f + PT}, \quad (1)$$

where *ATW* stands for average tax wedge, *PIT* is personal income tax, *SSC<sub>e</sub>* social security contributions paid by employees, *SSC<sub>f</sub>* social security contributions paid by firms/employer, *PT* payroll tax paid by employers, *CB* cash benefits and *w* net wage.

In the analysis we observe the tax wedge for an average worker, single, without children and employed in industry Sectors C-K,<sup>5</sup> at different wage levels (i.e. 67 %, 100 % and 167 % of average wage).

The methodological scope of this paper is threefold. Firstly, we examine the size of tax wedge, employment rate and unemployment rate in Croatia and in OECD and EU Member States in 2008<sup>6</sup> by using basic descriptive statistics.

Because of heterogeneity in the analysed data, we further apply hierarchical cluster analysis (based on Ward's method and squared Euclidean distance) to identify whether there are more homogenous groups of countries. Cluster analysis is performed on 39 countries (OECD and EU Member States plus Croatia) and includes employment and unemployment rate as dependent characteristics.

In the last part of our empirical analysis, we study the impact of tax wedge on unemployment rate. Following the macroeconomic empirical studies on this issue (see for example Nickell and Layard, 1999; Daveri and Tabellini, 2000; Belot and van Ours, 2004; Vörk *et al.*, 2007; Žižmond and Novak, 2006) we employ panel regression analysis, performed on the sample of 39 countries (OECD and EU Member States plus Croatia) between 2000 and 2008. The regression analysis includes random effects and control for heteroskedacity<sup>7</sup>. We formed a regression model (2) with the following specifications:

$$UR_{i,t} = \alpha + \beta_1 \cdot TW_{i,t} + \beta_2 \cdot D_{i,t} + \beta_3 \cdot DTW_{i,t} + \Pi \cdot \begin{bmatrix} EPL_{i,t} \\ GDPpc_{i,t} \\ IR_{i,t} \\ LP_{i,t} \end{bmatrix} + e_{i,t}, \quad (2)$$

where *UR* denotes unemployment rate in country *i* at time *t*, *TW* stands for tax wedge, *EPL* for employment protection legislation index, *GDPpc* denotes gross domestic product (GDP) per capita, *IR* is inflation rate and *LP* is labour productivity. Parameter *e* stands for stochastic disturbances. Moreover, we also introduce dummy variable *D* in the interactive and multiplicative form *DTW* (*D* multiplied by *TW*) in order to control for differences between high tax wedge countries (dummy variable takes the value 1) and low tax wedge countries (dummy variable takes the value 0). All variables were logarithmised. In parallel, we repeat the panel regression analysis by using employment rate as a dependent variable.

<sup>5</sup> According to NACE Rev. 2, sectors C-K were replaced by sectors B-N.

<sup>6</sup> We focus on data for 2008 in order to perform an analysis comparable among all countries included. Namely, data on tax wedge for 2009 are not yet available for all EU Member States.

<sup>7</sup> The decision to use panel regression model with random effects instead of fixed effects was based on the estimates of Hausman test. The use of random effects model was confirmed by the Breusch and Pagan Lagrangian multiplier test. The presence of heteroskedacity was confirmed by likelihood-ratio test, whereas Wooldrige test showed that data do not have first-order autocorrelation.

Data on unemployment and employment were collected on the basis of Labour Force Surveys and refer to the age group 15 to 64. Explanatory variable tax wedge refers to labour taxation of a single production worker without children. We performed three separate regression analyses differing only in the level of tax wedge, by which each referred to one wage level. We therefore obtained estimates for tax wedge at 67 %, 100 % and 167 % of average earnings. The other explanatory variables represent control variables. EPL index<sup>8</sup> presents a measure of labour market flexibility and covers three different aspects of employment protection: (i) individual dismissal of workers with regular contracts; (ii) additional costs for collective dismissals; and (iii) regulation of temporary contracts. As a measure of control for macroeconomic effects that may influence labour market developments we included inflation rate (in order to take into consideration effects in monetary or fiscal policy) and GDP per capita (expressed in Purchasing Power Standards (PPS)). Labour productivity is measured as GDP in PPS per hour worked. The data on labour productivity were obtained from The Conference Board (2010) statistical database.

The data needed for empirical analysis were obtained from three main sources:

- for OECD countries: OECD official databases (OECD.Stat, 2010) and official reports (OECD, 2008 and 2009a, b, c);
- for EU Member States: Eurostat (2010) and official reports of the European Commission (European Commission, 2009a, b and c);
- for Croatia: official databases and reports of Central Bureau of Statistics of the Republic of Croatia (2010).

The analysis focuses on the size of the tax wedge-unemployment relationship on the labour demand side and does not study in detail the effects of factors at the labour supply side and other labour market institutions.

#### **4 TAXATION OF LABOUR IN CROATIA IN INTERNATIONAL COMPARATIVE PERSPECTIVE**

Croatian legislation referring to income taxation and social security contribution system underwent several changes through the last 20 years (see Grdović Gnip and Tomić, 2010). According to Nestić (1998), these changes could create an atmosphere of instability, which discouraged both employers and employees from quickly and optimally responding to market signals. Such instability may decrease companies' business expectations which may reduce the companies' willingness to employ (Stubelj, 2010). Nevertheless, the legislation changes, in general, resulted in a decline of tax wedge. Namely, from 2000 to 2008 the tax wedge at the 67 % of average earnings in Croatia declined by approximately 6 % or 2.3 percentage points. Decline in tax wedge was higher at average wage level and 167 % of average wage, as it decreased by approximately 8 % (see Figure 1; data for EU-27 are inserted for comparison).<sup>9</sup> A high decline of tax wedge in 2000 and 2001 can be reasoned with an increase of personal allowance, changes in the marginal tax rates and reduction of employer's contributions. In the following year, the tax wedge slightly increased due to increase of employer's contributions. In 2003 personal allowance increased and employee's contributions decreased, so the tax wedge recorded a pin drop (it fell under the average of EU). From 2003

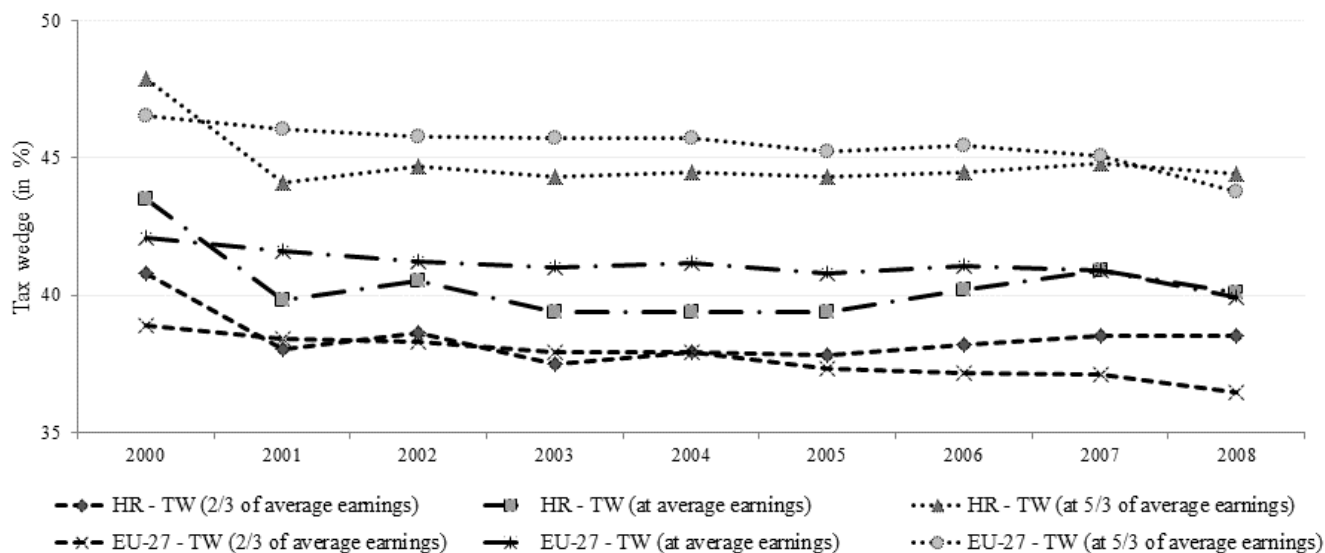
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<sup>8</sup> Until today OECD presented three versions of EPL index calculations. In this analysis we included the second version of the EPL index (see OECD, 2010).

<sup>9</sup> Between 2000 and 2008, the tax wedge in the EU-27 decreased, on average, by approximately 6 % at all three wage levels. A stronger decline was noticed in CEE countries together with three Nordic countries, in which the tax wedge, on average, decreased by 3.2 percentage points (or 0.36 percentage point/year). To a large extent, the reduction in tax wedge is almost entirely driven by the reduction in personal income taxation and in social security contributions of employers.

to 2008, despite the further increase in personal allowances (in 2005, 2006 and 2008), the tax wedge was slightly increasing due to the growth in gross wages. In 2009 Croatia introduced a special “crisis tax” levied on the net wage in order to mitigate the impacts of the financial crisis. According to Grdović Gnip and Tomić (2010), the introduction of the “crisis tax” would increase the tax wedge at 100 % average earnings for additional 1.2 percentage points (from 40.1 % (without “crisis tax”) to 41.3 % in 2009).

**Figure 1:** Tax wedge at different wage levels from 2000 to 2008 in Croatia and EU-27, in %



Sources: Eurostat, 2010; Central Bureau of Statistics, 2010; authors’ calculations.

The dynamics of tax wedge between 2000 and 2008 presented in the previous figure shows that Croatian worker, receiving average or 167 % of average wage, was less taxed than the average EU worker until 2007. Situation changed in 2008 due to higher decrease of average labour taxation in EU-27, mostly due to larger decrease in Cyprus, Poland, Bulgaria and in some other EU countries comparing to 2007. As can be seen from Table 1, in 2008, the low wage worker bore a higher tax burden than the average worker in EU-15, however lower than in CEE countries. Similar is true for high-wage workers. For worker with average wage, the taxation is, on average, much higher among old EU Member States and also CEE countries than in Croatia.<sup>10</sup> Nevertheless, the Croatian workers are exposed to considerably higher taxation if compared to OECD countries that are not members of the EU.

<sup>10</sup> Among EU Member States (ranked according to tax wedge level from highest to lowest), Croatia places on the 16<sup>th</sup> position at the 67 % average wage level, 18<sup>th</sup> position at the 100 % average wage level and on the 15<sup>th</sup> position at the 167 % average wage level. Among OECD countries (ranked according to tax wedge level from highest to lowest), it places on the 12<sup>th</sup> position at the 67 % of average wage level and on the 13<sup>th</sup> position at the 100 % and 167 % of average wage.

**Table 1:** International comparison of tax wedge at different wage levels, employment and unemployment rates, 2008 (in %)

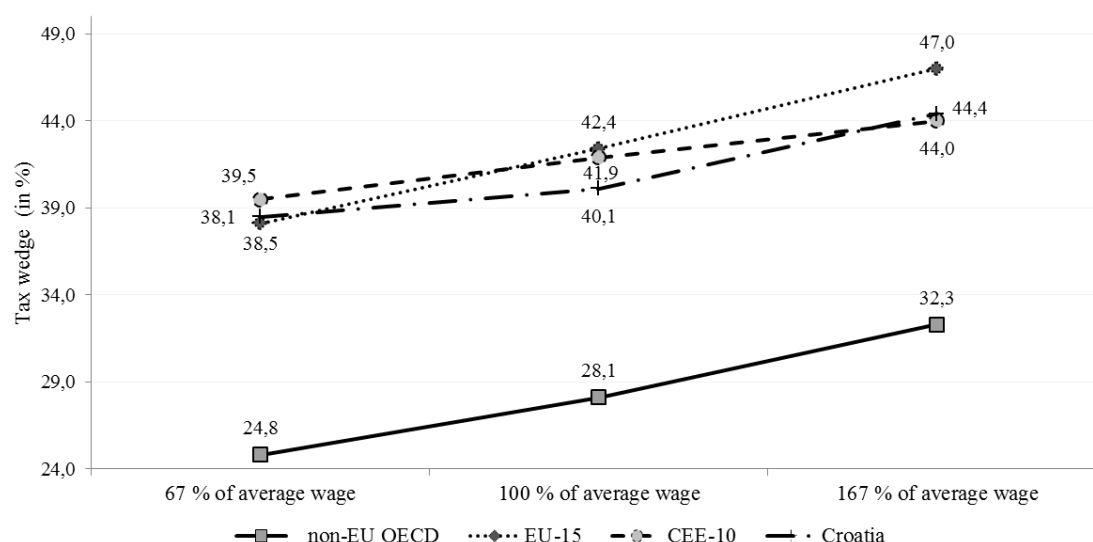
Group/country <sup>1</sup>	Tax wedge at			Employment rate	Unemployment rate
	67 % of average wage	100 % of average wage	167 % of average wage		
<b>OECD</b>	33.5	37.4	41.9	68.3	5.8
non-EU OECD	24.8	28.1	32.3	70.3	4.7
EU OECD	38.6	42.8	47.5	67.1	6.4
<b>EU-27</b>	36.5	39.9	43.8	66.4	6.3
<b>EU-15</b>	38.1	42.4	47.0	68.4	6.4
<b>CEE-10</b>	39.5	41.9	44.0	63.9	6.5
<b>Croatia</b>	38.5	40.1	44.4	57.8	8.6

Note:<sup>1</sup> OECD stands for 30 OECD member countries. Non-EU OECD includes 11 OECD member countries that are not members of the EU, whereas EU OECD includes 19 OECD member countries that are also members of the EU. EU-15 refers to EU Member States that become members of the EU prior to 2004. CEE-10 includes 10 Central and Eastern EU Member States that joined EU after 2004.

Sources: Eurostat, 2010; OECD.Stat, 2010; Central Bureau of Statistics, 2010; authors' calculations.

Croatia, as all other OECD and EU Member States (except for Bulgaria, which records equal tax wedge at different wage levels), has a progressive tax wedge, implying that tax wedge increases with an increase of wage level (see Figure 2). The progressivity of tax wedge stems from the progressive income tax rates, which, on the other hand, result in a redistributive effect, since they reduce the inequality of income distribution. Comparing to chosen groups, Croatia exhibits lower tax progressivity. This was confirmed also by Kosi and Bojnec (2010), who by calculating the measure of elasticity of after-tax wage to total labour costs (also known as CRIP) showed that, except for single parents with two children, taxation of wages in Croatia exhibits low tax progressivity.

**Figure 2:** Progressivity of tax wedge in selected groups of countries and in Croatia, 2008 (%)



Sources: Eurostat, 2010; OECD.Stat, 2010; Central Bureau of Statistics, 2010; authors' calculations.

Table 2 presents the structure of tax wedge at different wage levels in Croatia and selected groups of countries.

**Table 2:** Decomposition of tax wage at different wage levels in selected groups of countries and Croatia, 2008, in %

	non-EU OECD	EU OECD	EU-15	CEE-10	Croatia
<b>Components of tax edge/average wage<sup>1</sup></b>	<i>67 % of average earnings</i>				
PIT	44.9	29.4	27.1	20.9	17.6
Employee SSC	25.6	33.9	26.5	26.3	44.3
Employer SSC plus payroll tax	29.5	36.7	46.4	52.8	38.1
<i>Total<sup>2</sup></i>	<i>100</i>	<i>100</i>	<i>100</i>	<i>100</i>	<i>100</i>
	<i>100 % of average earnings</i>				
PIT	52.6	38.7	34.6	25.4	19.3
Employee SSC	22.7	30.0	23.2	24.9	42.5
Employer SSC plus payroll tax	24.7	31.2	42.3	49.7	33.2
<i>Total<sup>2</sup></i>	<i>100</i>	<i>100</i>	<i>100</i>	<i>100</i>	<i>100</i>
	<i>167 % of average earnings</i>				
PIT	62.5	50.3	45.6	29.0	28.5
Employee SSC	18.4	24.6	18.3	23.6	38.4
Employer SSC plus payroll tax	19.0	25.1	36.1	47.4	33.1
<i>Total<sup>2</sup></i>	<i>100</i>	<i>100</i>	<i>100</i>	<i>100</i>	<i>100</i>

Notes:

<sup>1</sup> Abbreviation PIT refers to personal income tax, SSC to social security contributions.

<sup>2</sup> Due to rounding total may differ one tenth of percentage point from aggregate of income tax, social security contributions and payroll tax.

Sources: Eurostat, 2010; OECD.Stat, 2010; Central Bureau of Statistics, 2010; authors' calculations.

In most of the EU Member States and also in Croatia social security contributions represent a major part of the tax wedge. Social security contributions and personal income tax are more evenly represented in tax wedge in OECD member countries that are not members of the EU. What's more, by increasing the wage level, the share of personal income tax in the structure of tax wedge in these countries increases profoundly. For example, in non-EU OECD countries personal income tax presents 62.5 % of the overall tax wedge at the 167 % wage level, whereas in EU-15 45.6 %, in CEE-10 yet only 29.0 %. Croatia exhibits similar share of personal income tax in overall tax wedge as CEE countries at the 167 % wage level, however at the other two wage levels the share is a lot lower (see Table 2). As regards the distribution of tax burden between the employers and employees, in most the countries, also in Croatia, the greater part of the tax burden is transferred to employees. An exception to this may present the CEE countries, as the employers bear 52 % of tax wedge at the 67 % of average earnings, however this share declines with an increase of wage level.



## 5 RELATIONS BETWEEN TAX WEDGE, EMPLOYMENT AND UNEMPLOYMENT

A close look at the data in Table 1 suggests that countries not only differ in tax wedge but also in employment and unemployment rate, respectively. The bivariate analysis performed on 39 countries (all member countries of OECD and EU and Croatia) pointed on the existence of statistically significant positive correlation between tax wedge (at all wage levels) and unemployment rate.<sup>11</sup> On the contrary, the correlation between tax wedge and employment rate was negative, however not statistically significant.

To identify groups of countries that are similar to each other according to unemployment and employment rate, a hierarchical cluster analysis using Ward's method and Euclidean distance as a measure function has been applied.<sup>12</sup> As can be seen from Figure 3, countries grouped into two main clusters depending on the size of unemployment and employment rate. The first cluster includes 27 countries (i.e. 69 % of the whole sample), which recorded higher employment rate and lower unemployment rate. The second cluster is a group of 12 countries, which exhibit the opposite characteristics, i.e. lower employment rate and higher unemployment rate. When comparing these two clusters of countries according to the level of tax wedge, it is noticeable that low tax wedge at all studied wage levels corresponds to lower unemployment and higher employment rate, and vice versa (see Table 3). The Mann-Whitney U test<sup>13</sup> confirmed that the differences between clusters in employment and unemployment rate and in tax wedge (at 67 % and 100 % average wage) are statistically significant at significance level of 5 %. The obtained results are comparable with the results of various empirical studies on the sample of OECD and EU countries (for example Nickell and Layard, 1999; Nickel, 2003; Daveri and Tabellini, 2000, Dolenc and Vodopivec, 2005; Bassanini and Duval, 2006; Šeparović, 2009; Dolenc and Laporšek, 2010; Grdović Gnip and Tomić, 2010; Jerman *et al.*, 2010; etc.).

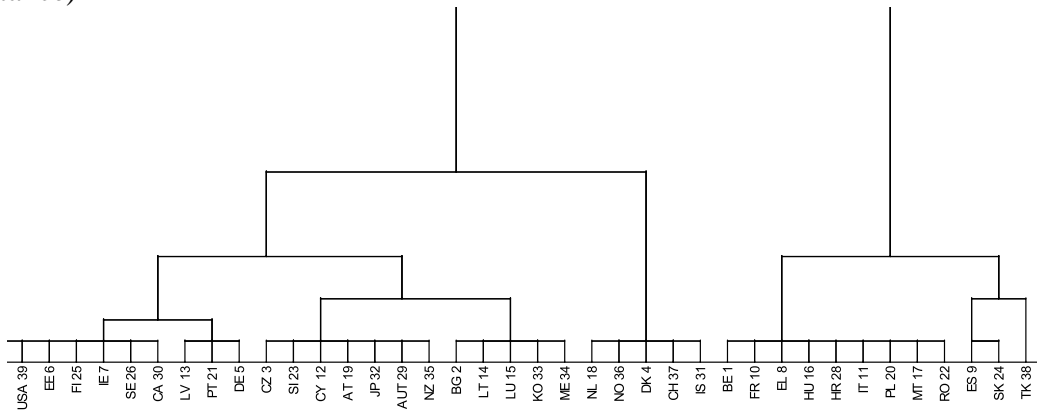
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<sup>11</sup> Pearson coefficient between unemployment rate and tax wedge at 67 %, 100 % and 167 % of average earnings amounted 0.380, 0.357 and 0.333, respectively, at significance level of 5 %.

<sup>12</sup> The variables used were standardized in order to avoid the influence of different averages on the relative importance of the variable.

<sup>13</sup> The Mann-Whitney U non-parametric test was used due to small number of studied countries.

**Figure 3:** Dendrogram using hierarchical clustering (Ward's method and squared Euclidean distance)



*Note:*

AT - Austria, AUT - Australia, BE - Belgium, BG - Bulgaria, CA - Canada, CH - Switzerland, CY - Cyprus, CZ - Czech Republic, DE - Germany, DK - Denmark, EE - Estonia, EL - Greece, ES - Spain, FI - Finland, FR - France, HR - Croatia, HU - Hungary, IE - Ireland, IS - Iceland, IT - Italy, JP - Japan, KO - Korea, LT - Lithuania, LU - Luxemburg, LV - Latvia, ME - Mexico, MT - Malta, NL - Netherlands, NO - Norway, NZ - New Zealand, PL - Poland, PT - Portugal, RO - Romania, SE - Sweden, SI - Slovenia, SK - Slovak Republic, TK - Turkey, UK - United Kingdom, USA - United States of America.

*Source:* Eurostat, 2010; OECD.Stat, 2010; Central Bureau of Statistics, 2010; authors' calculations.

**Table 3:** Characteristics of clusters obtained by the hierarchical clustering using Ward's method and squared Euclidean distance

Group		Tax wedge at			Employment rate	Unemployment rate	Countries
		67 % average wage	100 % average wage	167 % average wage			
Cluster 1 (n=27)	Mean	30.8	35.3	39.6	71.0	4.9	UK, USA, EE, FI, IE, SE, CA, LV, PT, DE, CZ, SI, CY, AT, JP, AUT, NZ, BG, LT, LU, KO, ME, NL, NO, DK, CH, IS
	Median	32.9	36.8	41.7	70.9	4.5	
	Std. dev.	11.4	9.4	9.0	5.6	1.6	
Cluster 2 (n=12)	Mean	38.8	42.5	46.1	59.0	8.1	BE, FR, EL, HU, HR, IT, PL, MT, RO, ES, SK, TK
	Median	38.6	41.2	44.0	59.1	7.6	
	Std. dev.	8.2	8.7	9.3	5.3	1.8	
Mann-Whitney U test (p)		97.0 (0.048)	92.0 (0.044)	100.0 (0.079)	12.5 (0.000)	27.0 (0.000)	

Note:

AT - Austria, AUT - Australia, BE - Belgium, BG - Bulgaria, CA - Canada, CH - Switzerland, CY - Cyprus, CZ - Czech Republic, DE - Germany, DK - Denmark, EE - Estonia, EL - Greece, ES - Spain, FI - Finland, FR - France, HR - Croatia, HU - Hungary, IE - Ireland, IS - Iceland, IT - Italy, JP - Japan, KO - Korea, LT - Lithuania, LU - Luxemburg, LV - Latvia, ME - Mexico, MT - Malta, NL - Netherlands, NO - Norway, NZ - New Zealand, PL - Poland, PT - Portugal, RO - Romania, SE - Sweden, SI - Slovenia, SK - Slovak Republic, TK - Turkey, UK - United Kingdom, USA - United States of America.

Sources: Eurostat, 2010; OECD.Stat, 2010; Central Bureau of Statistics, 2010; authors' calculations.

Croatia was grouped among countries with lower employment rate and higher unemployment rate which exhibit high tax wedge. Namely, Croatia recorded one of the highest unemployment rate and lowest employment rates among chosen groups in 2008.<sup>14</sup> However, there are eight low tax wedge countries that exhibit higher tax wedge at 67 % and 100 % wage level (and nine countries at the tax wedge at 100 % wage level) than Croatia.<sup>15</sup>

Using the classification obtained by cluster analysis, we further performed a discriminant analysis for each of the studied wage levels. The following functions of discriminant analysis were obtained:

$$\text{Discriminant function 1: } \hat{Z} = 6.378 + 0.028 \cdot TW_{67\%} - 0.132 \cdot ER + 0.268 \cdot UR$$

(3)

$$\text{Discriminant function 2: } \hat{Z} = 5.988 + 0.038 \cdot TW_{100\%} - 0.133 \cdot ER + 0.254 \cdot UR$$

(4)

<sup>14</sup> Among chosen countries (ranked according to unemployment rate from highest to lowest), Croatia with 8.6 % unemployment rate places on the 4<sup>th</sup> position (after Spain (11.4 %), Turkey (11.2 %) and Slovak republic (9.5 %)). With regard to employment rate (ranked from lowest to highest), Croatia (57.8 %) also places on the 4<sup>th</sup> position, after Turkey (44.9 %), Malta (55.3 %) and Hungary (56.7 %).

<sup>15</sup> Lower tax wedge countries with higher tax wedge than Croatia are Scandinavian countries (Denmark, Sweden and Finland), Germany, Austria, Netherlands, Czech Republic, Latvia and Slovenia.

**Discriminant function 3:**  $\hat{Z} = 5.920 + 0.040 \cdot TW_{167\%} - 0.135 \cdot ER + 0.254 \cdot UR$

(5)

*Legend:*  $TW_{67\%}$  – tax wedge at 67 % average wage;  $TW_{100\%}$  – tax wedge at 100 % average wage;  $TW_{167\%}$  – tax wedge at 167 % average wage; UR – unemployment rate, ER – employment rate.

*Note:* Cut-off value for is 0. Countries with positive Z have high tax wedge, high unemployment rate and low employment rate, and vice versa.

The low tax wedge countries with high employment and low unemployment rate demonstrated a negative discriminant score, whereas the high tax wedge group of countries with low employment and high unemployment rate demonstrate a positive discriminant score. The analysis showed that the discriminant function divided chosen countries in the same groups as cluster analysis with the exception of Germany and Lithuania.<sup>16</sup> This implies that probability of a country to be classified as a high tax wedge country with low employment and high unemployment rate increases if tax wedge increases (which, according to theoretical and empirical expectations, causes the decrease of employment and increase of unemployment rate, pushing up the probability even higher). However, the causality is not a clear cut.

## 6 THE IMPACT OF TAX WEDGE ON UNEMPLOYMENT

A bivariate correlation analysis pointed on the existence of statistically significant correlation between tax wedge (at all wage levels) and unemployment rate (see Section 5). To check the relation between tax wedge and unemployment rate in more detail we conducted panel regression analysis on the data for chosen 39 countries during 2000–2008 period.

As seen in Table 4, the estimates of the panel regression analysis, allowing for random effects, confirmed a significant positive impact of tax wedge on unemployment rate at studied wage levels. Assuming that a worker with 67 % of average wage is the most representative,<sup>17</sup> the results suggest that a 10 % increase in labour taxation implies a 4 % increase in unemployment rate, *ceteris paribus*. The impact of increasing tax wedge on unemployment is higher for high-wage workers, confirming that the elasticities between tax wedge and unemployment rate are increasing in wage.

<sup>16</sup> Both Lithuania and Germany were classified among low tax wedge countries due to relatively high unemployment rates (7.6 % in Germany and 5.9 % in Lithuania). However, both countries record negative discriminant scores (0.586 for Lithuania in discriminant function 1; 0.493 for Germany and 0.521 for Lithuania in discriminant function 2), as both countries exhibit tax wedge that is above average of high tax wedge group of countries.

<sup>17</sup> The real picture of wage distribution in the economy could be given by the median values of incomes. As the data on median of wages are in most countries not available for the studied period, we believe that the indicator of 67% of average wage is more closely to the actual distribution of wages. For example, in Slovenia the median of annual gross earnings amounted about 79 % in 2006 (Statistical Office of the Republic of Slovenia, 2009).

**Table 4:** Estimates of the panel regression analysis with random effects

<b>Dependent variable:</b> <i>logUR</i>	<b>Single person without children</b>			
	% of average earnings	67 %	100 %	167 %
<i>logTW</i>		0.418*	0.603**	0.781**
<i>logEPL</i>		0.018	-0.012	-0.024
<i>logGDP<sub>pc</sub></i>		-0.489*	-0.489*	-0.459*
<i>logIR</i>		-0.085**	-0.086**	-0.088**
<i>logLP</i>		0.057	-0.030	-0.085
<i>D</i>		0.272*	0.908	0.934
<i>DTW</i>		0.003	-0.014	-0.013
<i>Constant</i>		5.094**	4.752**	3.918
<i>R<sup>2</sup></i> :		0.590	0.638	0.627

Significance level: \*5 %, \*\*1 %.

Notes: All variables were logarithmised. Explanation of abbreviations is available in Section 3.

Sources: authors' calculations.

In parallel to the above analysis, we employed the second panel regression analysis using an employment rate as a dependent variable and leaving other explanatory variables the same. The estimates have showed an existence of a minor negative, however statistically insignificant impact of tax wedge of representative workers with 100 % and 167 % of average earnings on employment rate.

## 7 CONCLUSION

The paper examines the issue of labour taxation of Croatian worker in comparison to workers in OECD and EU Member States, studies the relations between tax wedge and labour market outcomes (employment and unemployment rate) and analyses the impact of tax wedge on unemployment in chosen countries.

The estimates of the empirical analysis showed that the level of labour taxation in Croatia is comparable to that in most of the OECD and EU Member States. Namely, Croatia recorded a lower tax wedge for a worker with 100 % of average earnings than EU-15 or CEE countries. The taxation of labour was also higher in CEE countries than in Croatia when observing low- and high-wage workers. On the other hand, the Croatian workers are exposed to considerably higher taxation if compared to non-EU OECD countries. The tax wedge is expected to increase in 2009 and 2010 due to the introduction of special "crisis" tax. Cluster analysis performed on the OECD and EU Member States plus Croatia showed that a high unemployment rate and low employment rate is associated with higher tax wedge and vice versa. Croatia was placed among countries with higher tax wedge. As hierarchical cluster analysis gave us only an indication on relation between labour taxation and labour market outcomes and does not present a general rule, a further panel regression analysis was performed. The estimates of the regression analysis showed that the tax wedge at all three wage levels (i.e. 67 %, 100 % and 167 % of average wage) has a significant positive impact on unemployment rate in chosen countries. This signifies that lowering the level of labour taxation should result in a decline of unemployment rate. The findings also pointed on possible negative impact of tax wedge on employment rate, yet it was statistically insignificant.

As Croatia is in its way to become a member of the EU, it should follow the policy recommendations of the EU on the reduction of tax wedge. Moreover, weak employment and elevated unemployment rate remain a particular concern in Croatia. Namely, the employment rate in 2008 amounts 57.8 % and is one of the lowest rates among OECD countries and EU Member States. On the other hand, the unemployment rate in 2008 amounted 8.6 % and is therefore 2.8 percentage points higher than the average of OECD countries and 2.4 points higher than the average in EU-27. Besides high unemployment rate, which additionally increased due to the global economic recession, a problem presents also a high inactivity among the working-age population that amounted to 37 % in 2008. The reduction in tax wedge may therefore decrease rather high unemployment rate in Croatia. Moreover, it could also contribute to the improvement of its economic situation by increasing productivity and competitiveness. Special emphasis in tax wedge reduction should be put on the lowering of the social security contributions, especially those paid by employees, what would require reforms in health and pension insurance system. However, we should keep in mind that the tax wedge is not sufficient measure to increase employment, as the high unemployment rate is also the consequence of high unemployment benefits, wage negation system, employment protection legislation, pension system, economic performance, etc. Moreover, the labour taxation, especially social security contributions, presents important budget revenue. As the Croatian budget is, according to Grdović Gnip and Tomić (2010) socially oriented and social security contributions present an important component of the budget, it is unlikely that in near future Croatia would lower its tax burden.

To conclude, the findings of this paper are, in general, in line with previous empirical research, as the empirical estimates confirm the detrimental effect of tax wedge on unemployment. However, one has to remember of the limitations of these findings deriving from the availability of good time series information on tax wedge, its composition, and other labour market outcomes. The analysis also does not take into the account the effect of global economic and financial crisis, as its impact on real economy were not evident in year 2008. Therefore, a further analysis on a country by country basis and analysis considering the effects of economic and financial crisis are needed. Yet the data that will reflect the latter will be available in 2011.

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## **UTJEČE LI OPOREZIVANJE RADA NA NEZAPOSLENOST? HRVATSKI RADNIK U MEĐUNARODNOJ PERSPEKTIVI**

### **SAŽETAK**

*Rad istražuje pitanje oporezivanja rada hrvatskih radnika u usporedbi s radnicima zemalja OECD i EU. Koristeći hijerarhijsku klaster analizu proučava se odnos između poreznog klina i ishoda tržišta rada, dok se panelnom regresijskom analizom, primijenjenom na podacima za 39 zemalja u periodu od 2000-2008, procjenjuje učinak poreznog klina na stopu nezaposlenosti. Empirijske procjene pokazuju da se Hrvatska svrstava među zemlje s višom nezaposlenosti i nižom stopom zaposlenosti, koju karakterizira viši porezni klin. Nadalje, procjene regresijske analize pokazale su da porezni klin na sve tri razine plaća (odnosno, 67%, 100% i 167% prosječne plaće) ima značajan pozitivni učinak na stopu nezaposlenosti. To znači da Hrvatska, kao i druge proučavane zemlje, treba nastaviti sa smanjivanjem poreznog klina jer će to umanjiti probleme nezaposlenosti i potaknuti stvaranje radnih mjesta.*

**Ključne riječi:** *porezni klin, troškovi rada, nezaposlenost, ekonomska politika, Hrvatska, OECD, EU*

**JEL klasifikacija:** *J30, J38, H24.*