HOW HARD DOES THE TAX BITE HURT? CROATIAN VS. EUROPEAN WORKER

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Abstract

The main objective of this paper is to analyse the tax burden in Croatia and to find out whether and how the size and the structure of total labour costs affect the functioning of the labour market. The tax wedge, together with employment and unemployment rates, is brought into play to classify EU countries and Croatia into clusters using K-means and hierarchical clustering. The results show that Croatia is classified among countries with a high tax wedge and a high unemployment rate. The same holds when, instead of the tax wedge, personal average tax rate is considered. However, in Croatia most of the tax burden is borne by the employees, not by the employers. Thus, the average Croatian industry worker bears a relatively high tax burden, which is exacerbated when the newly introduced "crisis tax" and increased VAT are taken into account.

Key words: tax burden, tax wedge, (un)employment, cluster analysis, Croatia, EU

1 Introduction

Nobody likes to pay taxes. Every taxpayer is pretty disgruntled when a part of their income is wrested away for the government. Therefore, the tax bite always hurts, but the

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strength of the pain depends upon how deep the bite goes. In 2009, after constant increases and introductions of different form of taxes since the beginning of the nineties, all taxpayers in Croatia experienced an additional burden aimed at alleviating the consequences of the financial crisis. The attitude among the general population in Croatia is that they have among the highest tax burdens in Europe, if not in the whole world. Yet, some empirical research suggests a different viewpoint. Therefore, this paper tries to give an objective picture of the situation in the labour market and in taxes (and contributions) imposed on workers as compared with that in EU countries.

The main issue that this paper deals with is the effect that the presence of taxes and social security contributions has on the functioning of the labour market, especially in Croatia. The existence of these levies is primarily justified by the government expenditures. Although only social security contributions are directly connected to the functioning of the labour market, both taxes and contributions may have different effects on the behaviour of labour supply and labour demand. At a certain level of wages, a higher tax burden increases unemployment and causes incentives for firms to work in the informal sector of the economy. Whether and to what extent the introduction of taxes on labour affects the outcomes in the labour market primarily depends on the elasticity of demand and supply curves and the flexibility of labour market.

It has been shown how high taxes on salaries contribute, not only to higher unemployment, but also to lower participation and employment in the labour market (Cazes and Nesporova, 2007). The size of the labour supply is probably the most important determinant of labour force competitiveness in any given country (Grdović Gnip and Tomić, 2009). Accordingly, by analysing the impact of taxes and contributions on the labour market, one can determine how much the government can influence the size of its labour market by increasing/decreasing taxes and/or social security contributions.

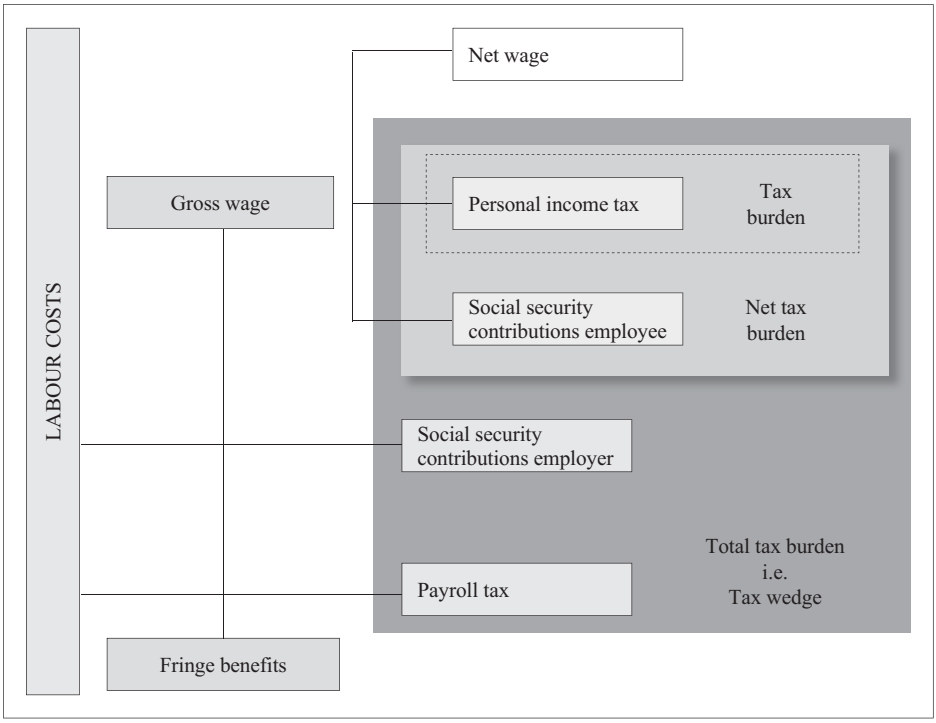
This paper consists of five parts. Section 2, after the introduction, presents a theoretical background of correlations between labour taxes and situation in the labour market, i.e. labour supply and demand. Section 3 gives a framework for the empirical analysis of tax wedge effects giving an overview of the situation in the Croatian labour market in comparison with those in EU member states and a complete overview of tax wedges and personal average tax rates for different wage levels. Section 4 deals with the classification of EU countries and Croatia into clusters using hierarchical and K-means clustering with the data for 2008. Besides the tax wedge and employment/unemployment rates, the section takes into account the personal average tax rate and the EPL index, but it also introduces the consumption tax (VAT only) as another burden on the net average wage of every worker. In the case of Croatia, it considers the possible further development of the Croatian tax wedge in 2009, reflecting two crucial facts: (1) the newly introduced "crisis tax" levied on net wages, and (2) the increase of consumption tax in form of VAT. Section 5 gives concluding remarks and possible policy recommendations too.

2 Theoretical background

Payroll taxes, income taxes and social contributions together, drive a *wedge* between the cost of labour to the firm and the net wage of the worker and therefore may have dis-

tortional effects on the functioning of the labour market. These distortional effects of the tax wedge are primarily observed through the lower supply of labour by workers, but also through less job creation by firms than would be the case without taxes and contributions. The tax wedge actually appears between total labour costs, which consist of gross wage, social security contributions, payroll tax and fringe benefits, and the net wage received by employees. Between all the categories of total labour costs, there are two relevant bases according to which different levels of tax burden can be considered (Figure 1).

Figure 1: Labour costs and levels of tax burden



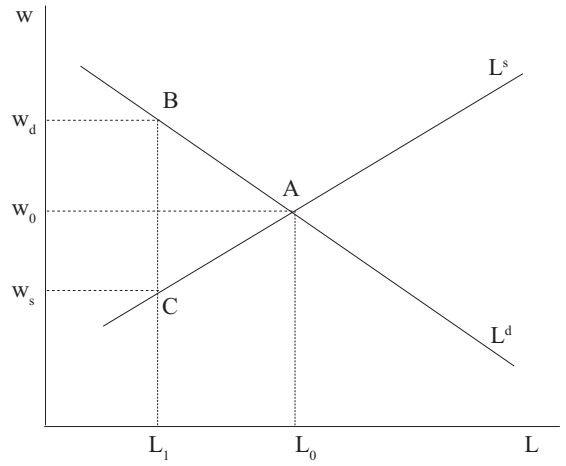
Source: Authors' plotting.

According to the OECD and as shown in Figure 1, taxes and contributions levied on gross earnings form three levels of burden: (1) the *tax burden* – which represents the share of personal income tax in the gross wage; (2) the *net tax burden* or *personal average tax rate* – which is the share of all employee tax liabilities in the gross wage, i.e. the share of the sum of personal income tax and social security contributions paid by employee in the gross wage; and (3) the *total tax burden* or the so called *tax wedge* – which represents the sum of personal income tax and employee and employer social security contributions together with any payroll tax expressed as a percentage of labour costs (OECD, 2005).

In the equilibrium framework, *Dalton's law* says that the effects on employment, labour costs and net wages are the same, no matter who is taxed, employers or employees

(Muysken, van Veen, and de Regt, 1999). From basic microeconomic theory it is well known that the impact of labour costs on the size of the labour force is highly dependent on the elasticities of supply and demand curves (Figure 2), but also on the degree of flexibility in the labour market (Gora et al., 2006; Nestić, 1998). For example, social security contributions paid by employers usually affect labour demand, while contributions paid by employees influence labour supply in the labour market. However, this does not have to hold, especially in the case of perfectly competitive labour and product markets. In an imperfectly competitive environment, which corresponds to the real world situation, the tax burden will be divided between employees and employers in accordance with their negotiating power, which depends both on the institutional environment as well as on the structure of labour and product markets (Nestić, 1998).

Figure 2: The effect of taxes on labour supply and labour demand



In a competitive environment, initially the equilibrium is at the combination of employment L_0 and wages w_0 (point A). After the introduction of taxes, employment declines to L_1, labour costs for the firm (demand side) are w_d while net wages for the workers (supply side) are w_s. The total tax wedge is equal to $w_d - w_s$, where the employer pays $w_0 - w_s$. The steeper the demand curve, the higher the share of the tax is paid by the firm; the steeper the supply curve, the higher the share of worker. The after-tax equilibrium level of employment (L_1) is not eficient which creates a deadweight loss (triangle ABC).

Source: Authors' plotting based on Boeri and van Ours (2008).

However, Muysken, van Veen, and de Regt (1999) by analysing data for the Netherlands in the period 1960-1995 found that *Dalton's law* does not hold since the long run elasticities of employers' and employees' taxes with respect to unemployment differ greatly: 0.42 and 0.10, respectively. Yet since it is very hard to determine elasticities of labour supply and demand for the entire economy, elasticities are most often calculated on a sectoral basis (Gora et al., 2006). Still, results showed that the elasticities are higher for labour-intensive industries with lower-skilled workers. Many of the EU new member states, together with Croatia, have a relatively high share of employed persons in the primary and secondary sectors, which implies a greater influence of labour costs on the size of their labour supply than is the case with the EU old member states.

Yet all this assumes the functioning of a perfectly competitive labour market, which rarely exists in practice. Modern labour markets, especially the European, are characterised by market imperfections and the existence of many institutions that serve to correct market failures. Boeri and van Ours (2008) emphasize the fact that taxes on labour cause different effects on different income groups mainly because of the characteristics of the tax-benefit system, primarily unemployment benefits. For instance, if, in one household, neither of the parents is working, the disincentive for one of them to accept a job is quite significant, but if one of them is already employed, the disincentives for the other to find employment are much smaller. Evidently, labour costs will exercise different impacts on the functioning of the labour market depending on the institutional characteristics. For instance, Daveri and Tabellini (2000) found a correlation between taxes and unemployment across countries only when they differentiated groups of countries regarding the differences in their labour market institutions.

De Haan, Sturm, and Volkerink (2003), evaluating different proxies for the tax burden on labour, conclude that even though these proxies differ substantially, their correlation is quite high and that the significance of the impact of the tax burden on unemployment is not very sensitive with respect to the choice of particular indicator. The most important difference between different proxies used for the tax wedge is whether or not consumption taxes are included into the calculation of the tax wedge. According to Nickell (1997; 2004), the total tax burden in the labour market is actually the sum of the personal average tax rate and the consumption tax rate, where income taxes observed alone cannot tell much on the behaviour of agents in the labour market. Nickell (1997), in a cross-section analysis, showed that a fall in total tax burden by 10 percentage points reduces unemployment by approximately 25 percent and raises labour supply by approximately 2 percent. The same author (Nickell, 2004), using results from different empirical studies, confirmed similar outcomes, but stressed the fact that besides taxes, the differences in social security contributions are likely to be responsible for the differentials in the labour market indicators between countries.

In the work by Mortensen and Pissarides (2002), where various tax and subsidy effects on wages and (un)employment are evaluated within their search and matching framework, it is shown that wage and employment subsidies increase both employment and wages. In addition, hiring subsidies reduce unemployment duration, but increases the incidence where effects on total employment remain indeterminate. Firing taxes, on the other hand, have reverse effects, with employment effects remaining uncertain.

Behar (2009) evaluates the impact of tax wedges and unemployment benefits on labour market outcomes (employment, unemployment and inactivity) in the CEE-10 EU member states. His results show that the new EU member states share similar characteristics, which differentiate them from the old EU member states, i.e. even if they do have bad labour market outcomes, their institutions and labour market policies are more flexible than in the rest of the Europe. In addition, he demonstrates how of all the institutional explanations for the differences in labour market outcomes, the tax wedge and the benefit system are chief candidates. Furthermore, Gora et al. (2006) show how the tax wedge creates especially undesirable effects for the unskilled, i.e. low wage earners. They hold that the re-

lative tax burden for this group is higher in the new member states (NMS) than in EU-15, because of the relative endowment of the new member states in low-skilled labour.

Dolenc and Vodopivec (2005) found that OECD countries could be classified into two groups taking their tax wedge, employment and unemployment rates into consideration. The first group has a high tax wedge, a low employment and high unemployment rate, while for the second the opposite holds true. In addition, they state that EU members are generally characterised by a higher tax burden on labour and higher unemployment rates than OECD countries, with Slovenia being one of the EU countries with the highest tax wedge. They suggest that Slovenia could benefit from a reduction of the tax burden on its labour, but emphasizing that tax reduction alone would not be enough to reduce unemployment and boost employment.

Something similar has been shown in Grdović Gnip and Tomić (2009) by using 2006 data for 38 countries (EU and OECD members, plus Croatia). Cluster analysis showed that a high unemployment rate is evidenced in countries with higher tax wedge, while a higher employment rate is registered in countries with a lower tax wedge. Croatia came out as a country with a high tax wedge and a high unemployment rate, primarily because of the high social security contributions paid by employees. They conclude that possible labour tax reduction could enhance employment and result in higher competitiveness of the labour supply, but with more challenges than benefits in the short run.

Kesner-Škreb (2007) also emphasises high social security contributions paid by employees as the main source of burdens for labour in Croatia. She states that it is not necessary to increase the tax burden via the introduction of new forms of taxation because the tax burden in Croatia is already one of the highest in the CEE countries. She proposes just the opposite, i.e. starting to unburden both the economy and the people, primarily by reducing contributions in order to reduce labour costs and increase the competitiveness of the economy. Additionally, Urban (2009b) compares the tax wedge in OECD countries and Croatia in 2008 and concludes that the tax wedge in Croatia has a value similar to that in neighbouring countries, but higher than the average OECD country value. The same holds when the new "crisis tax" is added to the calculation for Croatia.

Nestić (1998) suggested lowering the tax burden on labour in Croatia, not to lower high unemployment rates, but primarily to increase the competitiveness of Croatian economy and to reduce informal sector employment. On the other hand, Nestić (2009), comparing the tax wedge between European countries and Croatia, concludes that frequent remarks about the above average tax burden on wages in Croatia do not hold.

3 Labour market and taxing wages in Croatia

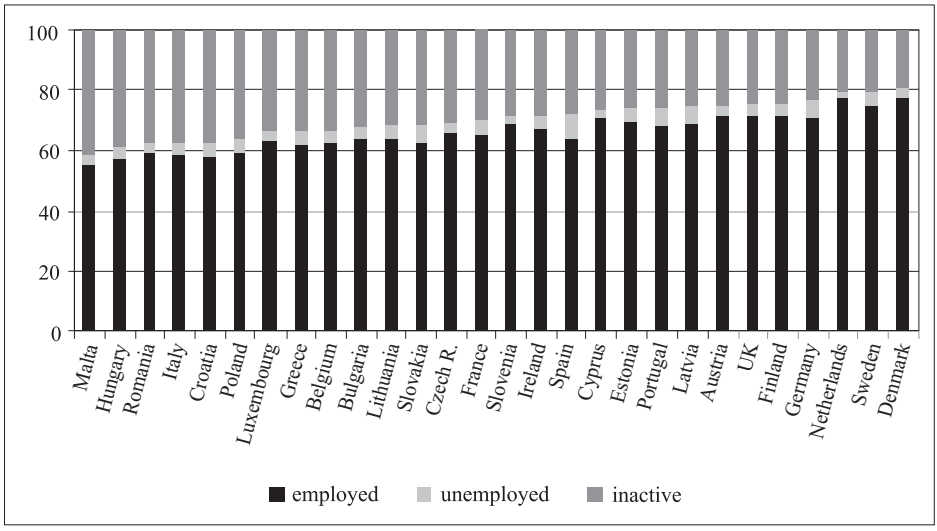
3.1 Labour market: Croatia in the context of the European Union

Placing the Croatian labour market in the EU framework gives an interesting picture. Figure 3 presents structure of the working-age population of the EU countries plus Croatia by their economic activity. In almost all of the countries, almost 30 percent of the population aged from 15 to 64 is inactive. This implies a high share of dependent population, with an emphasis on the increasing share of the dependent elderly population. In addition,

among the active population, different shares of employed and unemployed populations are noticeable. Old member states show relatively better results compared to the new states and to accession countries. The two "ends" are represented by Malta, with a very low share of active population (around 60%), and Denmark, with a very high share of active working-age population (around 80%). Croatia belongs to the "low end" of the distribution with a 37% share of inactive people among the working age population.

The main reason for inactivity in the working-age population in most of these countries is that these people are still attending some form of education or training. On the other hand, in countries like the Czech Republic, Slovenia, and Croatia a high share of the inactive population in this group is already retired. This is the result of the early retirement schemes and disability pensions in these countries. Other reasons include illness, disability, or some family responsibilities. An interesting part of this group consists of those who "think no work is available" and represent some discouraged people who would work but think that there is no vacant positions for them, and the highest share of this group, after Bulgaria and Italy (9.3% and 9.2%, respectively) exists in Croatia (5,1% of inactive working-age population).

Figure 3: Working-age (15-64) population structure by economic activity (in %), 2008



Source: Eurostat, 2009.

Table 1 shows some specific characteristics of the active population among the new member states of the EU countries plus Croatia. Croatia demonstrates one of the lowest activity rates in all indicators presented in the table. So, the total activity rate among the working-age population in Croatia is only 63.2 percent, while for the total EU it is 70.9 percent in the year 2008. These activity rates show that Croatian labour force is well underused, which must undermine its competitiveness.

Table 1: Activity rates by gender, age groups and highest level of education attained for the working-age population, 2008 (in %)

Country	Total	Gender		Age groups			Education (ISCED)		
		Females	Males	15-24	25-54	55-64	0-2	3-4	5-6
EU-27	70.9	63.9	78.0	44.5	84.8	48.1	54.3	75.6	87.2
EU-15	72.5	65.4	79.5	48.4	85.3	50.0	57.7	77.5	87.3
Belgium	67.1	60.8	73.3	33.4	85.7	36.1	45.4	72.0	86.2
Bulgaria	67.8	63.1	72.5	30.1	85.5	48.7	38.7	76.2	88.1
Czech Republic	69.7	61.0	78.1	31.1	87.3	49.5	29.9	75.8	84.7
Denmark	80.8	77.1	84.4	72.5	90.2	58.7	68.3	83.9	90.8
Germany	76.5	70.8	82.1	52.5	87.9	58.8	54.3	80.5	89.4
Estonia	74.0	70.1	78.3	41.4	88.1	65.1	39.8	80.1	87.9
Ireland	72.0	63.1	80.7	52.5	81.6	55.5	52.2	76.6	87.4
Greece	67.1	55.1	79.1	30.2	82.0	44.2	56.8	67.1	87.7
Spain	72.6	63.2	81.8	47.7	83.8	49.2	65.6	75.4	87.3
France	70.1	65.6	74.8	39.2	88.7	40.0	53.2	74.8	84.7
Italy	63.0	51.6	74.4	30.9	78.1	35.5	50.3	72.3	82.3
Cyprus	73.6	65.7	82.0	41.7	86.5	56.6	53.7	76.9	89.1
Latvia	74.4	70.5	78.6	42.9	88.9	63.3	43.4	80.7	90.7
Lithuania	68.4	65.5	71.4	30.8	85.5	55.6	24.0	73.0	90.5
Luxembourg	66.8	58.7	74.7	29.0	83.4	35.1	51.8	69.4	85.7
Hungary	61.5	55.0	68.3	25.0	80.1	33.1	33.5	68.2	81.8
Malta	58.8	40.2	76.9	52.2	70.8	30.4	50.5	74.6	86.6
Netherlands	79.3	73.3	85.3	73.2	88.5	54.7	65.8	82.8	89.4
Austria	75.0	68.6	81.4	60.8	87.3	41.9	55.5	79.7	87.6
Poland	63.8	57.0	70.9	33.1	82.5	33.3	29.3	68.4	87.0
Portugal	74.2	68.9	79.5	41.6	88.0	54.4	71.8	71.5	91.0
Romania	62.9	55.2	70.6	30.4	78.3	44.2	44.8	67.5	88.1
Slovenia	71.8	67.5	75.8	42.9	90.1	34.2	45.9	75.3	90.6
Slovakia	68.8	61.3	76.4	32.4	87.8	41.9	26.3	76.3	87.0
Finland	76.0	73.9	77.9	53.5	88.6	59.7	53.2	80.2	88.5
Sweden	79.3	76.9	81.7	52.8	90.4	72.8	61.0	85.2	91.3
United Kingdom	75.8	69.4	82.4	61.7	84.9	59.9	62.7	79.5	87.8
Croatia	63.2	56.6	70.0	34.7	80.9	38.8	39.3	68.6	86.1

Source: Eurostat, 2009.

Low activity and employment rates for the two end age groups (15-24 and 55-64) indicates the low flexibility of the Croatian labour market in which there is no possibility for part-time employment or other schemes for those in education or those with decreased abilities. In addition, the activity rate for the female population is lower in each age group with the highest difference in the end-groups. Females are equal to males when it

comes to employment rates only in the group of people with tertiary education, where the activity rate is well above average (around 86%), while for those with only primary education the activity rate moves only around 39 percent.

Comparing Croatia with the new EU countries for the year 2007 it is observable that Croatia has one of the highest total labour costs (Figure 4). According to Nestić (2009), employers often use this comparison as an argument to judge the adverse competitive position of Croatian companies in relation to companies from the countries in the region. FDI in Croatia is indeed much lower[1] than in some of the EU new member states. One of the reasons for this might be high labour costs. Nestić (2009) also emphasizes that even though Croatia has a relatively high level of wages compared to other CEE countries it had the smallest increase in wages, expressed in euro, in the period 1996-2006 (this is especially applicable to the period after the year 2000), which shows a convergence in the level of wages in the region.

Yet, looking only at total labour costs, one can easily be misled due to the fact that total labour costs are composed quite differently in each country. Moreover, if we compare the productivity of labour[2] together with total labour costs (Figure 4), we can see that Croatian total labour costs are not that high in the whole EU context. However, the price of labour is less important in modern, technologically advanced economies. In labour-intensive industries this factor is very important. Since Croatia is still behind the most advanced economies and has to compete for foreign investments with other countries in Eastern Europe its total labour costs must be considered relatively high.

In addition, the Croatian labour market is considered to be pretty rigid; actually it is among the countries that have the most rigid employment protection legislation in Europe (Matković and Biondić, 2003; Rutkowski, 2003). When one considers the inadequate qualification structure of its labour force (Bejaković, 2004) and the very low activity, the situation seems even worse. For instance, in 2008 36.8 percent of the working-age population (15-64) was officially inactive. In addition, demographic ageing is exacerbating the current situation. As Obadić (2004) states, this implies low utilization of human resources, which leads to lower levels of production and economic welfare, and finally, to a lower level of competitiveness in the labour market.

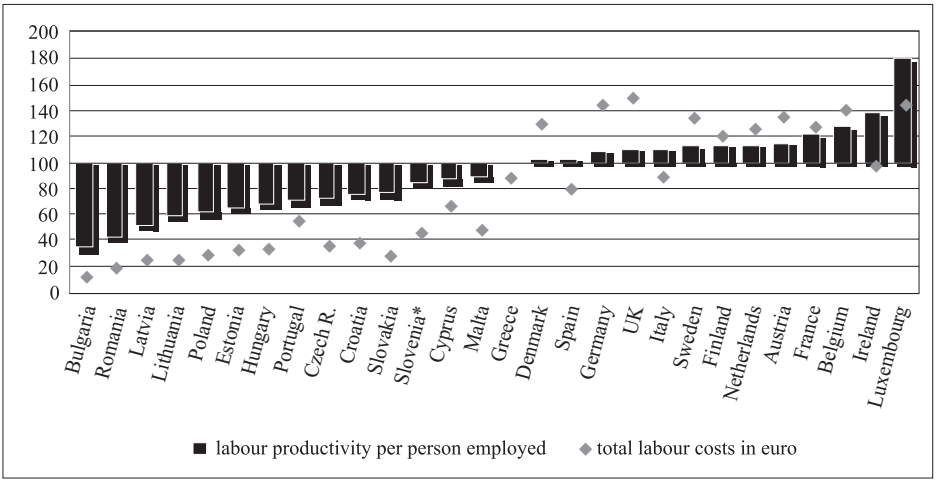
Figure 5 shows some recent trends in the Croatian labour market. It is noticeable that the activity rate only slightly declined during the observed period (2002-2008). However, the structure of the active population has changed. The employment rate slightly increased while both the administrative as well as the ILO unemployment rate decreased on average. However, the thing that worries is the high share of those who are unemployed for more than 12 months (55.2% of total unemployed persons in 2008). The positive trend in the labour market is a result of high economic growth during the same period[3]. However, due to the world financial crisis, this trend should slow down in 2009 and 2010.

[1] For instance, in 2006 direct investment flows as a percentage of GDP in the reporting economy were 23.8% in Bulgaria; 17.7% in Hungary; 9.2% in Romania; 8.4% in Slovakia; and only 7.9% in Croatia (Eurostat, 2009).

[2] Here, the productivity of the labour is measured as GDP in purchasing power standards per person employed.

[3] According to the data from Croatian National Bank, the average GDP growth rate in the same period was 4.24%.

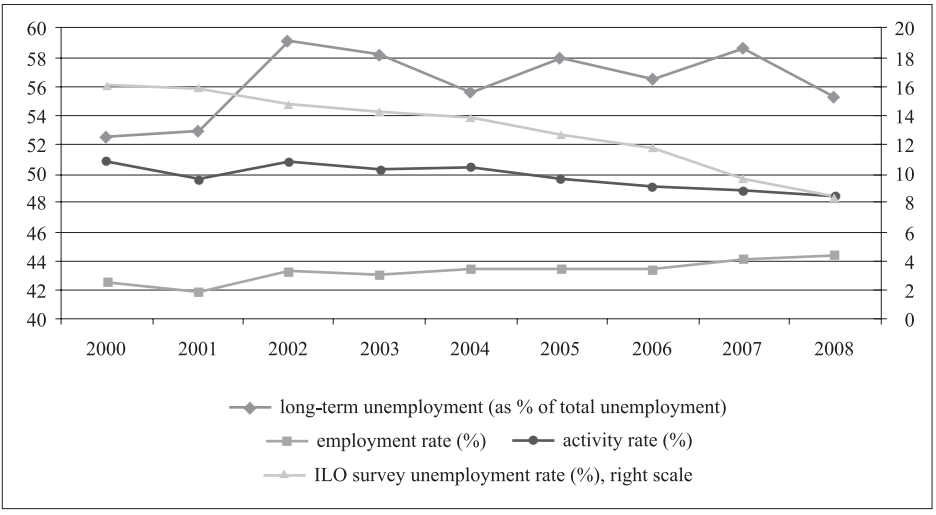
Figure 4: Labour productivity and total labour costs (EU-7=100), 2007



**Total labour costs for Slovenia are for 2006.*

Source: Eurostat, 2009.

Figure 5: Trends in the Croatian labour market, 2000-2008



Source: CBS, 2009.

All this shows the scarcity of labour supply in Croatia. There could be a number of reasons for this situation. Perhaps labour demand is too low, and the discouraged workers are becoming inactive. Possibly different benefits schemes motivate people to leave

the labour force or, maybe, there are just not enough people who could actually work in Croatia.

3.2 Taxing wages in Croatia

Croatian personal income tax legislation went through numerous changes, amendments and revisions since its introduction in 1994. Undertaken adjustments referred to changes in all spheres, i.e. personal allowances, tax brackets, tax rates, other allowances, and deductions. Although the first changes in the fundamentals of personal income taxation in Croatia appeared already after the first month of its implementation, when the level of personal allowance was raised for the first time, key changes occurred in two periods: (1) in year 2000, when income from dividends and profit shares became a taxable income category[4]; higher personal allowances for workers domiciled in the areas of special national concern were brought in, and a third tax bracket with an appropriate tax rate was introduced; and (2) in year 2003 when the fourth tax rate (for the appropriate tax bracket) with different allowances and deductions[5] was introduced (see Appendix 1, Table A1).

Closely related to income taxation and subject to numerous changes is the social security system (see Appendix 1, Table A2), which embraces six different contributions: pension insurance, health insurance, occupational injuries, employment, child allowances, and water management. All of these, except the water management contribution, were until 2003 split between employees and employers. From 2003 onwards, the contributions are no longer "shared" among employees and employers. There is a clear distinction that contributions for pension insurance are paid by employees only, while employers pay the contributions for health insurance, occupational injuries and employment. Therefore, in Croatia employees have 20% taken from their gross earnings for social security contributions, while employers pay an additional 17.2% of employees' gross earning for the same purpose.

Evidently, in a period of less than 20 years, numerous changes in both the taxation as well as the contribution system have taken place. Worth mentioning is that frequent changes in the taxation system create an atmosphere of instability, which discourages both sides in the labour market (employers and employees) from quickly and optimally responding to market signals (Nestić, 1998).

In the nineties the OECD started to identify representative taxpayers and to calculate the amount of their taxes. Achievement of this goal has been in the OECD focus since then, and the Organisation developed a methodology for calculating income tax burdens, i.e. tax wedges, which has been broadly accepted and became representative all over the world.

The pillar of the methodology until 2003 was represented by the manufacturing sector, i.e. sector D according to the NACE[6]. In 2004 the OECD concluded that the manu-

[4] According to the previous personal income tax legislation, the taxable income category included wages, salaries, pensions, self-employment income and rents.

[5] The introduced allowances and deductions included life- and health-premiums, voluntary pension insurance, health protection and medical treatment outlays, health insurance, paid rent and mortgage.

[6] NACE stands for "statistical Nomenclature of economic Activities in the European Community" and is used to designate the consecutive versions of the statistical nomenclature relating to economic activities developed by the European Union since 1970.

facturing sector alone may not be representative any longer due to a constant lowering of the share of employed persons in that sector[7], and extended its definition to NACE sectors from C to K[8]. According to the broadening of industry coverage the main focus switched to the single "average worker" instead of the previously defined "average production worker"[9]. The "average production worker" was defined as *an adult full-time production worker in the manufacturing sector whose wage earnings are equal to the average wage earnings of such workers* (OECD, 2005), while the "average worker" corresponds to the same worker operating in sectors C to K and therefore is rather called "industry worker" than "manufacturing worker".

According to this, an average worker in the industry sector (C-K) in Croatia is considered in all the following calculations (from now on, average worker is meant as industry worker, single and without children). It needs to be emphasized that the personal income tax in Croatia, apart from the standard income tax, includes also a surtax that is levied on the amount of the calculated income tax liability. The tax rate of the income surtax differs among local authorities, as it represents a local tax and local authorities have complete jurisdiction over it[10]. The personal income category therefore includes the surtax too (taken into consideration below). Because every local authority can individually decide about the introduction and the rate of such surtax, a weighted average[11] among local authorities is calculated and the weighted average income surtax rate in Croatia turned out to be 11.16%[12].

Figure 6 shows the tax wedge and personal average tax rate for a Croatian average industry worker at different wage levels from 1994 to 2009. The tax wedge represents the sum of personal income tax and employee and employer social security contributions expressed as percentage of total labour costs, while the personal average tax rate is defined, according to the OECD definition, as the sum of personal income and employee social security contributions expressed as a percentage of gross wage earnings.

The highest tax wedge and personal average tax rate in Croatia were registered in 1994 when the personal income synthetic taxation was introduced (at 100% average wage level it is 52.02% of total labour costs and 41.18% of gross wage, respectively). From 2000 onwards, at the 100% wage level the tax wedge moved around 40.33% of total la-

[7] The OECD noticed that the share of workers in the manufacturing sector was constantly falling in the nineties. Average earnings of workers employed in the manufacturing sector became increasingly less representative and less "typical". Therefore the OECD decided that average earnings should be determined on the basis of employees working in a broadened set of industries and specifically decided to include categories C to K (more in OECD, 2004).

[8] To the "pure" manufacturing sector (D); the OECD added: mining and quarrying (C); electricity, gas and water supply (E); construction (F); wholesale and retail trade, repair of motor vehicles, motorcycles, personal and household goods (G); hotels and restaurants (H); transport, storage and communications (I); financial intermediation (J); and real estate, renting and business activities (K).

[9] It is worth mentioning that the OECD covers tax burden calculations for different family-types (married, with or without children) and different wage levels too.

[10] Every city and county in Croatia may introduce personal income surtax as part of their tax revenues. A county can regulate a surtax rate up to 10%, a city with fewer than 30,000 inhabitants up to 12%, a city with more than 30,000 inhabitants up to 15% and the city of Zagreb up to 30%. There are 126 cities and 429 counties in Croatia. From those, 78 cities and 178 counties have introduced the personal income surtax in their tax systems.

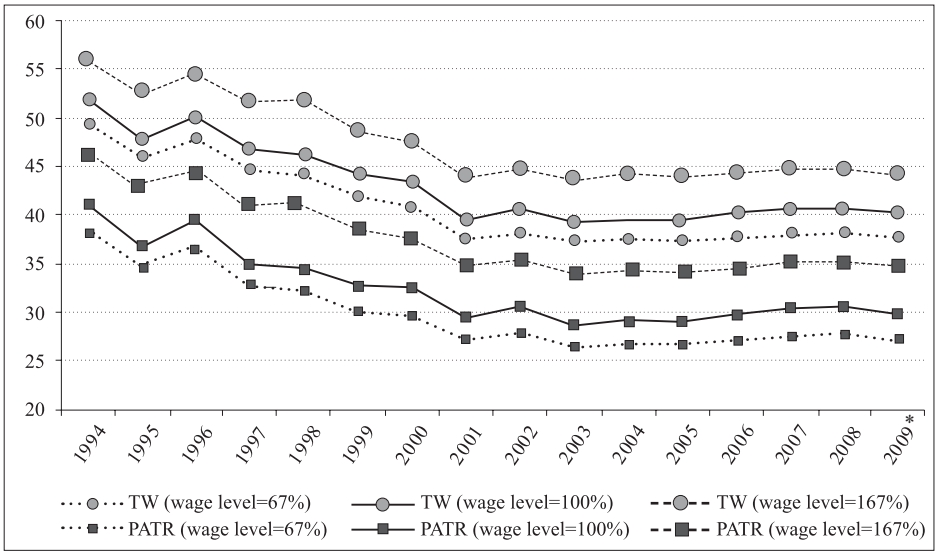
[11] The weighted average income surtax rate is calculated by taking as respective weights the number of persons living in the city/county according to the Population Census data from 2001.

[12] This percentage is taken into account for calculating all income tax burden categories in this paper.

bour costs while the personal average tax rate was around 30%. The difference between the two indicators in all observed periods was between 10 and 11.3 percentage points, i.e. 10.9% on average. In 1998 the difference between the tax wedge and the personal average tax rate attained 13.9% due to a 9.7% increase in gross wage and a slightly higher decrease in employee social security contributions than those paid by employers.

On average, no matter what wage level is taken into account, between 1994 and 2009 both the tax wedge and the personal average tax rate registered annual decrements. For the 100% average wage level these decrements result in annual changes of 1.8% and 2.3% respectively, which accounts for a total decrement of about 12% approximately for each indicator.

Figure 6: Tax wedge (TW) and personal average tax rate (PATR) for a Croatian average industry worker[13] at the different wage levels from 1994 to 2009 (in %)



Note: The tax wedge and the personal average rate for years that experienced changes in the income taxation system and/or social security contributions (see Appendix 1, Tables A1 and A2) are shown as annual averages of monthly resulting tax wedges and personal income tax rates, so to take all changes into account.

**For 2009 the calculation is based on averaging available data from January to November, without considering the "crisis tax".*

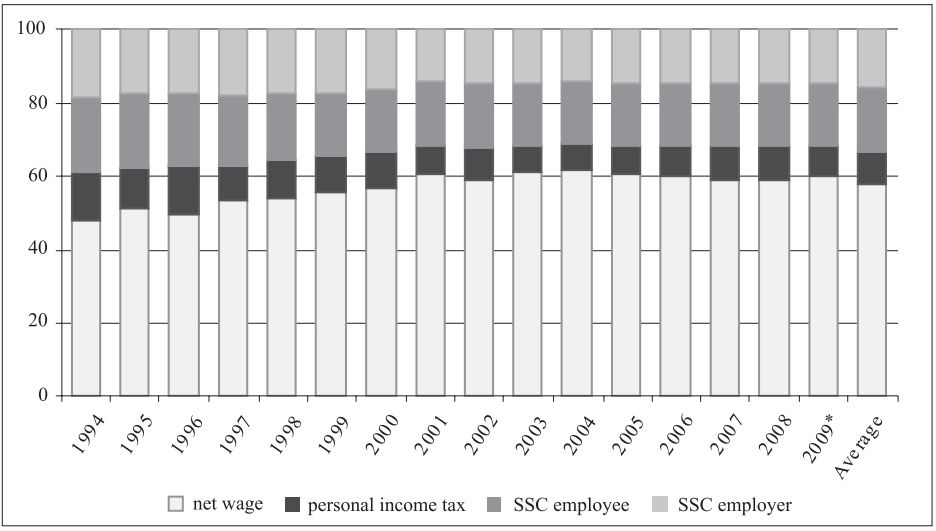
Source: Authors' calculation.

[13] Although until 2004 OECD defined a manufacturing worker as one working in sector D according to NACE, Figure 6 (and other figures that resulted from the authors' calculation of the tax burden prior to year 2004) shows tax wedge and personal average tax rate calculations based on average earnings of an industry worker in the broadened set of industries (C-K) for all the observed periods. The calculation of the same indicators based just on sector D's average gross wage did not show any significant differences from the up-to-date calculation methodology. Differences were at most large 0.2 percentage points.

The newest change in the personal income taxation introduced in July 2009 is the "crisis tax". It is a tax levied on the net wage, and represents another burden shouldered by employees, as it additionally decreases their net wage[14]. The Croatian government introduced this new form of taxing labour in 2009 in order to alleviate the impact of the financial crisis. If this is taken into account as a part of the total personal income tax paid by the employees at 100% average wage level, the total tax wedge for Croatia in 2009 comes to 41.32%, which generates a 1.2 percentage points higher burden (without considering this, it is 40.13%), while the personal average tax rate amounts to 31.23%, i.e. increases by 1.4 percentage points (without the "crisis tax" it amounts to 29.83%).

The decomposition of total labour costs for an average industry worker at the 100% wage level in Croatia shows that around 40% goes for tax and contribution payments, while the remaining 60% is left to employees as net wage (Figure 7).

Figure 7: Structure of labour costs for an average industry worker in Croatia at the 100% wage level in the period between 1994 and 2009 (in %)



**For 2009 the calculation is based on averaging available data from January to November, excluding the "crisis tax".*

Source: Authors' calculation.

From 2000 onward, a stabilisation among labour cost categories can be noticed, due to there being fewer changes in both the personal income taxation and the social security contribution system (see Appendix 1). The level of the net wage is on average around

[14] The "crisis tax" is applied to the net wage as its tax basis. It is not levied on net wages under 3,000.00 kuna. Net wages between 3,000.00 and 6,000.00 kuna are subject to the rate of 2%, while on a net wage above 6,000.00 kuna a 4% "crisis tax" is levied. More about this in Urban (2009a).

56.98% of total labour costs, but it is worth noticing that in the last observed periods it was 2.89 two percentage points higher than the average for the whole period, while in the nineties it was even 9.01 percentage points lower (1994). On average, 33.74% of total labour costs consist of social security contribution payments, while 9.41% goes for personal income tax costs.

In the structure of the tax wedge of an average industry worker at 100% wage level, social security contributions dominate. The portion of paid personal income tax is around 20% of the tax wedge, while the total of employee and employer social security contributions exceeds two-thirds of the tax wedge. If the "crisis tax" is considered for 2009, then the structure slightly changes. The share of total social security contributions decreases from 79.1% to 76.81%, while the share of personal income tax increases from 20.9% to 23.19%.

In the observed period (1994-2009) approximately 45% of total labour costs went for social security contributions and income tax-payments in Croatia, from which approximately 65% was paid by an average industry worker, who actually gave up 35% of gross wage for tax and contribution payments. The constituent components of those 45% were approximately 76% due to the high social security contributions in Croatia, while just 24% was due to personal income tax. Similarly, from the 35% approximately two-thirds on average went for social security contribution payments, the rest for personal income tax. The higher level of tax burdens, especially high contributions in the transition countries, is a consequence of the frequent early retirement of workers laid off during the restructuring process and the growth of social expenditures that were concomitant upon high unemployment (Petrović, 2007).

If the Croatian labour taxing system is brought in a broadened picture including EU and OECD member states a few other things can be noticed. It is important to stress that in the period between 1996 and 2008 the average tax wedge (at 100% average wage level) in EU member states was 37.9% and it is possible to say that it was almost constant through the whole period (standard deviation 0.5%). The average tax wedge among old member states (EU-15) was slightly higher (39.5%), while among new member states (NMS-12) it was somewhat lower (35.91%), but both registered a constant trend. If additionally OECD countries (except EU countries members of OECD) are considered none of the countries registers a tax wedge level above the EU-27 average.

4 Empirical analysis: a Croatian versus a European worker

In order to determine the impact of the total labour costs on the size of the labour force a differentiation between total labour costs and net earnings needs to be made. The difference between net earnings in Croatia and the EU countries is somewhat smaller than that in total labour costs. Moreover, the structure of labour costs differs greatly among countries. For instance, while for both the EU-15 and the NMS-12 social security contributions paid by employers make the highest share in the difference between total labour costs and net earnings, for Croatia and Slovenia the biggest part of this difference consists of the social security contributions paid by employees.

If different wage levels are taken into account (Table 2) it is noticeable that an average Croatian worker bears a higher tax burden at lower wage level (67%) than an average European worker. The opposite is true for a higher wage level (167%), when the European worker from the old member states bears more of a tax burden than the same Croatian colleague, while a similar worker from the new member states remains still less taxed. Although the same conclusion refers to the tax wedge and personal average tax rate, the difference is higher when the latter is observed.

Two opposite trends are to be noticed. If the tax wedge is considered, then when moving from a lower to a higher wage level the rank of Croatia amid all the EU member states increases. This means that when countries are ranked according to the tax wedge level (from highest to lowest) Croatia assumes the 18th position at the 67% wage level and the 15th place at the 167% wage level. When the personal average tax rate is analysed the opposite trend is registered, i.e. the lower the wage level the higher the ranking position of Croatia amid EU member states. This means that when countries are ranked according to the personal average tax rate (from highest to lowest) Croatia takes the 8th place at the 67% wage level, but the 11th at the 167% wage level. Similar movements are characteristic of old member states plus Slovenia and Hungary, while other new member states register a decline in the ranking position when the wage level increases for both burden measurements, i.e. for the tax wedge and personal average tax rate.

Typically, countries with a higher tax wedge have lower employment and higher unemployment rates. Even though this is given straightforwardly, hierarchical and K-means clustering provide more evidence for this relation between the labour costs, proxied by tax wedge or personal average tax rate, and the main indicators of the size of the labour supply, i.e. employment and unemployment rates[15].

The cluster analysis gathers cases in relatively homogenous groups based on some dependent characteristics. In this way, the dependent characteristics are tax wedge (or personal average tax rate) at 100% average wage level, employment and unemployment rates in 2008[16], while cases are represented by an efficient sample of 28 countries, i.e. members of the European Union plus Croatia. Hierarchical clustering using the Ward method and squared Euclidean distance as a measure function, grouped countries into three main clusters depending on the size of tax wedge, employment and unemployment rates[17]. Table 3 shows some descriptive statistics for the three clusters.

The first cluster is a group of 16 countries, i.e. 57% of the sample that registered a lower tax wedge, lower unemployment rate and higher employment rate. The second cluster is a group of nine countries, i.e. 32% of the whole sample that registered a higher tax wedge and a higher unemployment rate than countries from the first cluster. The three countries in the third cluster (Malta, Cyprus and Ireland) represent the low end of the distribution and significantly "rebound" from the sample. Therefore, they are excluded from the

[15] Data used in the cluster analysis are shown in Appendix 2.

[16] For seven countries, data for 2007 are used, as those for 2008 were not available. These countries are Bulgaria, Estonia, Latvia, Lithuania, Cyprus, Malta, and Romania, while for Slovenia the latest available data are for 2006. All of these are marked with *.

[17] In order to prove stability, same clustering is done by changing the order of cases, because in hierarchical clustering solutions may depend upon order of cases (it accounts for all hierarchical clustering in this paper).

Table 2: Tax wedge and personal average tax rate for an average industry worker at different wage levels (as % of labour costs) in 2008

Wage level	Tax wedge (as % of total labour costs)			Wage level	Personal average tax rate (as % of gross wage)		
	67%	100%	167%		67%	100%	167%
Austria	44.4	48.8	50.9	Austria	28.2	33.9	38.1
Belgium	50.3	56.0	61.1	Belgium	36.0	42.5	49.3
Bulgaria[a]	32.0	36.5	40.0	Bulgaria[a]	16.0	21.5	25.0
Cyprus[a]	12.0	13.9	21.0	Cyprus[a]	12.0	8.5	16.0
Czech Republic	40.0	43.4	46.1	Czech Republic	19.0	23.6	27.3
Germany	47.3	52.0	52.6	Germany	37.0	42.7	45.6
Denmark	38.9	41.2	49.7	Denmark	38.4	40.9	49.6
Estonia[a]	39.0	38.7	41.0	Estonia[a]	18.0	20.2	22.0
Spain	33.8	37.8	41.5	Spain	13.9	19.0	24.3
Finland	38.3	43.5	49.3	Finland	23.4	30.0	37.2
France	45.5	49.3	53.2	France	25.9	27.8	33.3
Greece	37.6	42.4	47.5	Greece	20.1	26.3	32.7
Hungary	46.7	54.1	59.1	Hungary	28.0	38.3	45.1
Ireland	16.0	22.9	34.0	Ireland	7.0	14.6	26.9
Italy	43.0	46.5	51.6	Italy	24.7	29.3	36.0
Lithuania[a]	41.0	43.0	44.0	Lithuania[a]	23.0	25.3	27.0
Luxembourg	29.6	35.9	42.8	Luxembourg	20.0	27.2	35.1
Latvia[a]	41.0	42.4	43.0	Latvia[a]	27.0	28.6	30.0
Malta[a]	19.0	23.6	33.0	Malta[a]	12.0	17.8	28.0
Netherlands	41.7	45.0	46.6	Netherlands	31.8	36.1	41.1
Poland	38.7	39.7	41.3	Poland	27.3	28.6	30.5
Portugal	32.9	37.6	43.5	Portugal	17.0	22.8	30.1
Romania[a]	42.0	43.4	45.0	Romania[a]	26.0	27.8	30.0
Sweden	42.5	44.6	52.6	Sweden	23.8	26.7	37.2
Slovenia[a]	40.0	44.0	50.0	Slovenia[a]	30.0	34.3	40.0
Slovakia	36.1	38.9	40.7	Slovakia	19.3	22.8	25.4
United Kingdom	29.7	32.8	37.5	United Kingdom	22.9	25.6	30.3
Croatia	38.1	40.1	44.4	Croatia	27.5	30.5	35.2
EU-27	37.0	40.6	45.1	EU-27	23.4	27.6	33.2
EU-15	38.1	42.4	47.6	EU-15	24.7	29.7	36.5
NMS-12	35.6	38.5	42.0	NMS-12	21.5	24.7	28.9

[a] *Data are for 2007.*

Source: OECD (2009); Eurostat (2009); Authors' calculation for Croatia.

first two clusters. The smallest variances in all three variables among countries are shown in the second cluster, while the highest variances are registered among the three countries separately classified in the third cluster. Croatia is grouped among countries with a high tax wedge and high unemployment rate, because of the strong correlation between these

two variables. Two facts are worth noticing: (1) among all countries, no matter the cluster in which they are classified, Spain and Croatia had the highest unemployment rates (11.4% and 8.6%, respectively), and (2) there are nine[18] countries classified in the first cluster (lower tax wedge and lower unemployment rate), although they register a higher tax wedge than Croatia. Evidently, it is not only the income taxation system that is responsible for high employment rates. This will be discussed below.

Table 3: Cluster statistics using Ward method in hierarchical clustering (variables: tax wedge, employment and unemployment rates)

Ward method		**Min**	**Max**	**Mean**	**Std. deviation**	**Countries**
Cluster 1	Employment rate	62.3	78.1	69.1	4.2	16 countries BG* LU ES SK EE* PT UK AT DE LT* SI* CZ FI LV* SE DK
	Unemployment rate	3.4	11.4	6.3	2.1	
	Tax wedge	32.8	52.0	41.3	4.9	
Cluster 2	Employment rate	55.3	64.9	60.3	3.1	9 countries BE HU FR PL **HR** GR IT RO* NL
	Unemployment rate	2.7	8.6	6.8	1.7	
	Tax wedge	39.7	56.0	46.3	5.8	
Cluster 3	Employment rate	56.7	70.9	65.0	7.4	3 countries IE CY* MT*
	Unemployment rate	3.8	6.1	5.3	1.3	
	Tax wedge	11.9	22.9	17.8	5.5	
Total	Employment rate	55.3	78.1	65.9	5.8	28 countries
	Unemployment rate	2.7	11.4	6.4	1.9	
	Tax wedge	11.9	56.0	40.6	9.1	

Note: All variables are significant at the 95% level.

AT – Austria, BE – Belgium, BG – Bulgaria, CY – Cyprus, CZ – Czech Republic, DE – Germany, DK – Denmark, EE – Estonia, ES – Spain, FI – Finland, FR – France, GR – Greece, HR – Croatia, HU – Hungary, IE – Ireland, IT – Italy, LT – Lithuania, LU – Luxembourg, LV – Latvia, MT – Malta, NL – Netherlands, PL – Poland, PT – Portugal, RO – Romania, SE – Sweden, SI – Slovenia, SK – Slovakia, UK – United Kingdom.

Source: Authors' calculation.

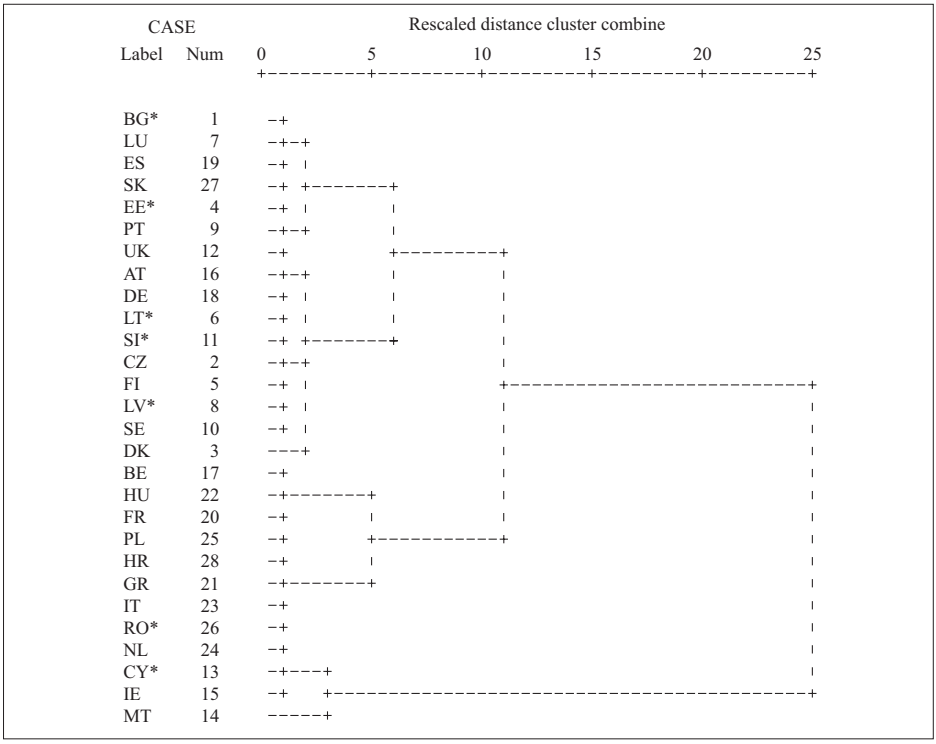
Figure 8 shows the hierarchical clustering using the dendrogram. As the dendrogram shows, countries in the first cluster (Table 3) can be divided into two additional "sub-clusters": one gathering Bulgaria, Luxembourg, Spain, Slovakia, Estonia, Portugal, and United Kingdom, whose tax wedges and unemployment rates are lower; and the other consisting of Austria, Germany, Lithuania, Slovenia, Czech Republic, Finland, Latvia, Sweden and Denmark, whose tax wedges and unemployment rates are higher.

In order to show the appropriate values of tax wedge, unemployment and employment rate in the cluster centres and the distance between these centres, K-means cluster analy-

[18] Those countries are: Latvia, Czech Republic, Lithuania, Finland, Slovenia, Sweden, Austria, Germany and Denmark.

sis is carried out. This analysis does not show the same cluster participation for all countries. Table 4 shows values at initial and final cluster centroids. The initial cluster centres are vectors with values based on the tax wedge, employment and unemployment rates, which refer to the countries with the lowest tax wedge (cluster 3), lower tax wedge (or middle tax wedge – cluster 1) and countries with highest tax wedge (cluster 2). Final cluster centres are reached doing three iterations, when the process of redistribution of the units stops and there are no further changes to the cluster centres. The variability among countries is minimised when the tax wedge in cluster one assumes the value of 40.3% of total labour costs, the centre of the tax wedge in cluster two assumes the value of 50.2% of total labour costs, and the centre of the tax wedge in cluster three assumes the value of 20.1% of total labour costs.

Figure 8: Dendrogram using the Ward method in hierarchical clustering



AT – Austria, BE – Belgium, BG – Bulgaria, CY – Cyprus, CZ – Czech Republic, DE – Germany, DK – Denmark, EE – Estonia, ES – Spain, FI – Finland, FR – France, GR – Greece, HR – Croatia, HU – Hungary, IE – Ireland, IT – Italy, LT – Lithuania, LU – Luxembourg, LV – Latvia, MT – Malta, NL – Netherlands, PL – Poland, PT – Portugal, RO – Romania, SE – Sweden, SI – Slovenia, SK – Slovakia, UK – United Kingdom.

Source: Authors' calculation.

Important to notice is that Austria and Germany switched their participation from the first cluster (according to hierarchical clustering) to the second cluster (according to K-

means), i.e. from lower tax wedge to higher tax wedge cluster. Something similar, but in the opposite direction, happened to Greece, Poland, Romania and Croatia, meaning the change from a higher tax wedge cluster to a lower tax wedge cluster. Although these countries may be considered "marginal cases" it is important to say that hierarchical clustering identifies relatively homogenous groups of cases based on the selected characteristics taking the *similarity measures* into account, while, oppositely, K-means clustering does not compute distances between all pairs of cases and does not take similarity between variables into account. Therefore, changes among classifications may occur. According to variables inserted in the cluster analysis, to the importance of the linkage between them and to the purpose of the analysis (i.e. finding relations of cause and effect among the three variables), hierarchical clustering gives more suitable and significant results. That is because relationship and connection among employment, unemployment and tax wedge is analysed, and this classifying method takes the previously mentioned similarity measure into account. Also, worth noticing is that for the first two clusters mean values, i.e. values in the cluster centres, amid hierarchical and K-means clustering, significantly differ, as a consequence of taking or not similarity measures into account.

Table 4: K-means clustering statistics (variables: tax wedge, employment and unemployment rates)

K-means clustering		**Initial cluster centres**	**Final cluster centres**	**Countries**
Cluster 1	Employment rate	64.0	67.0	18 countries BG* LU ES SK EE* PT UK LT* SI* CZ FI LV* SE DK GR PL RO* **HR**
	Unemployment rate	11.4	6.6	
	Tax wedge	37.8	40.3	
Cluster 2	Employment rate	62.0	64.0	7 countries BE HU FR IT NL AT DE
	Unemployment rate	7.0	6.2	
	Tax wedge	56.0	50.2	
Cluster 3	Employment rate	71.0	65.0	3 countries IE CY* MT*
	Unemployment rate	3.8	5.3	
	Tax wedge	13.9	20.1	

	Iteration History			
	Iteration 1	**Iteration 2**	**Iteration 3**	
Cluster 1	5.417	1.032	0.000	Convergence achieved due to no or small change in cluster centres. The maximum absolute coordinate change for any centre is .000. The current iteration is 3. The minimum distance between initial centres is 18.820.
Cluster 2	6.039	0.000	0.000	
Cluster 3	4.929	4.532	0.000	

Note: All variables are significant at the 95% level.

AT – Austria, BE – Belgium, BG – Bulgaria, CY – Cyprus, CZ – Czech Republic, DE – Germany, DK – Denmark, EE – Estonia, ES – Spain, FI – Finland, FR – France, GR – Greece, HR – Croatia, HU – Hungary, IE – Ireland, IT – Italy, LT – Lithuania, LU – Luxembourg, LV – Latvia, MT – Malta, NL – Netherlands, PL – Poland, PT – Portugal, RO – Romania, SE – Sweden, SI – Slovenia, SK – Slovakia, UK – United Kingdom.

Source: Authors' calculation.

As shown in table 2, while the Croatian tax wedge at the 100% average wage level moves around the EU-27 average in 2008, the personal average tax rate for the average Croatian worker at the 100% wage level in the same year is above the average rate registered in old and new member states, and above the EU-27 average as well. This means that "European workers" on average bear a smaller burden, i.e. social security contributions paid by employers in EU countries represent a higher share in the overall tax wedge than in Croatia. Therefore, the same analysis is conducted using, instead of the tax wedge, the personal average tax rate at 100% average wage level. Results show Croatia even "closer" to countries with a higher tax burden and higher unemployment rate (Table 5).

Table 5 shows the results of the hierarchical clustering that differentiated three clusters. The first cluster gathers countries with the lowest tax burden borne by an average worker. As well as Cyprus, Malta and Ireland, it is interesting to notice that several countries, i.e. Bulgaria, Czech Republic, Estonia, Portugal, Spain and Slovakia are added to this cluster. When the tax wedge was used as a measure, these were gathered among countries with a lower (but not the lowest) tax burden, and yet, when the personal average tax rate is taken into account, they appear among countries with the lowest tax burden. This is so, because social security contributions paid by employers register a high share in the total labour costs in these countries.

Countries belonging to clusters two and three are mainly divided because of the differences among employment and unemployment rates (when taking the similarity measures into account), not the personal average tax rate. It is possible to observe that the mean of the latter in cluster three is just 0.6 percentage points lower than in cluster two. Therefore, the same conclusion may appear again, i.e. that Croatia is classified among countries with a high tax burden, low employment and high unemployment rate[19]. The Netherlands may be considered a special case or even a low end of the third cluster, because of its low employment rate (55.3%) and low unemployment rate (2.7%).

However, since countries with a higher tax wedge than Croatia may have lower unemployment and/or higher employment rate, the tax burden on labour (expressed as tax wedge or personal average tax rate) alone cannot tell the whole story about the functioning of the labour market. Therefore, some additional factors need to be added into the analysis. The existing literature implies that the impact of labour costs on the size of the labour force is highly dependent on the degree of flexibility in the labour market. As already mentioned, the Croatian labour market is not considered to be flexible, i.e. it has one of the most rigid legislations in Europe. The employment protection legislation index, developed by the OECD, measures the procedures and the costs involved in dismissing and in hiring workers on fixed-term or temporary work agency contracts[20]. The greater the value of the index, the greater the overall strictness of employment protection legislation (see Appendix 2). It is important to note that employment protection refers to only one dimension of

[19] Similar results appear when K-means clustering with personal average tax rate as a burden measure is taken into account. This classification method gathers nine countries (Denmark, Finland, Latvia, Sweden, Slovenia, Austria, Belgium, Germany and Hungary) with the highest tax burden, and leaves four of them (Cyprus, Ireland, Estonia and Malta) as those with lowest tax burden. Croatia remains classified among the same countries as in hierarchical clustering when the personal average tax rate is considered as the tax burden measure.

[20] For details, see: www.oecd.org/employment/protection.

the complex set of factors that influence labour market flexibility, but this indicator will serve for illustrative purposes in this paper.

Table 5: Cluster statistics using the Ward method in hierarchical clustering (variables: personal average tax rate, employment and unemployment rates)

Ward method		**Min**	**Max**	**Mean**	**Std. deviation**	**Countries**
Cluster 1	Employment rate	62.3	70.9	65.7	4.5	9 countries BG* CZ EE* PT CY* MT* IE ES SK
	Unemployment rate	3.8	11.4	6.7	2.5	
	Personal average tax rate	8.5	23.6	18.9	4.8	
Cluster 2	Employment rate	68.6	78.1	71.8	3.1	9 countries DK FI LT* LV* SE SI* UK AT DE
	Unemployment rate	3.4	7.6	5.7	1.5	
	Personal average tax rate	25.3	42.7	32.0	6.5	
Cluster 3	Employment rate	55.3	64.9	60.7	7.4	10 countries LU BE FR GR HU IT NL PL RO* **HR**
	Unemployment rate	2.7	8.6	6.7	1.7	
	Personal average tax rate	26.3	42.5	31.4	5.5	
Total	Employment rate	55.3	78.1	65.9	5.8	28 countries
	Unemployment rate	2.7	11.4	6.4	1.9	
	Personal average tax rate	8.5	42.7	27.6	8.1	

Note: All variables are significant at the 95% level.

AT – Austria, BE – Belgium, BG – Bulgaria, CY – Cyprus, CZ – Czech Republic, DE – Germany, DK – Denmark, EE – Estonia, ES – Spain, FI – Finland, FR – France, GR – Greece, HR – Croatia, HU – Hungary, IE – Ireland, IT – Italy, LT – Lithuania, LU – Luxembourg, LV – Latvia, MT – Malta, NL – Netherlands, PL – Poland, PT – Portugal, RO – Romania, SE – Sweden, SI – Slovenia, SK – Slovakia, UK – United Kingdom.

Source: Authors' calculation.

If the EPL index[21], as one of the possible causes for (un)employment, is brought in to the hierarchical clustering along with the tax wedge, employment and unemployment rates, Croatia remains classified among countries with the highest tax wedges together with high labour market rigidity (Table 6).

It is again observable that Croatia is clustered in this group because of its high labour market rigidity and high unemployment rate. The first cluster gathers countries with the lowest tax wedge and the lowest labour market rigidity, while the second cluster includes countries with a high (but not the highest) tax wedge and middle labour market flexibility[22]. Nevertheless, again we have a situation that even though both tax wedge and EPL index are higher in the second cluster, those countries have also higher employment rates (lower unemployment rates) than countries in the first cluster. This contradicts our

[21] Since its introduction in 1985, the OECD calculated three versions of the EPL index. In this paper, the second version that was worth in the period 1998-2008 is used. It includes the weighted sum of version 1 sub-indicators for regular contracts (EPR_v1, weight 5/12), temporary contracts (EPT_v1, weight 5/12) and collective dismissals (EPC, weight 2/12).

[22] If the same variables are used in K-means clustering, similar conclusions appear. There are several countries that switched places, but Croatia remains among the countries with a high tax wedge and high labour market rigidity, along with Italy, Hungary, France, Belgium, Portugal, Netherlands and Poland.

assumption that the introduction of a new variable in the form of the EPL index would result in "better" grouping of the countries according to their tax burden and its impact on the (un)employment rates. Evidently, in order to get a complete picture, additional variables would need to be included in the analysis. Yet, we were focused here on the impact of the tax burden on the labour market outcomes, and widening the analysis to new directions would probably take attention away from the main focus of this paper.

Table 6: Cluster statistics using the Ward method in hierarchical clustering (variables: tax wedge, EPL index, employment and unemployment rates)

Ward method		**Min**	**Max**	**Mean**	**Std. deviation**	**Countries**
Cluster 1	Employment rate	62.3	71.5	66.6	3.4	8 countries BG* EE* ES IE LU PT SK UK
	Unemployment rate	5.1	11.4	7.2	2.3	
	Tax wedge	22.9	38.9	34.6	5.4	
	EPL index	1.1	3.4	2.2	0.8	
Cluster 2	Employment rate	66.6	74.3	71.2	3.4	9 countries AT CZ DE DK FI LT* LV* SE SI*
	Unemployment rate	3.4	7.7	5.6	1.6	
	Tax wedge	40.9	48.8	44.1	3.9	
	EPL index	1.8	2.8	2.3	0.3	
Cluster 3	Employment rate	55.3	64.9	60.3	3.1	9 countries BE FR GR HU IT NL PL RO* **HR**
	Unemployment rate	2.7	8.6	6.8	1.7	
	Tax wedge	39.7	56.0	46.2	5.9	
	EPL index	1.9	2.9	2.5	0.4	
Total	Employment rate	55.3	78.1	65.9	5.8	26 countries
	Unemployment rate	2.7	11.4	6.4	1.9	
	Tax wedge	11.9	56.0	40.6	9.6	
	EPL index	1.1	3.4	2.3	0.5	

Note: Tax wedge and EPL index are significant at the level of 99%. Employment and unemployment rates are significant at the 95% significance level.

Data for the EPL index for Cyprus and Malta are unavailable. Therefore there are 2 missing cases.

AT – Austria, BE – Belgium, BG – Bulgaria, CY – Cyprus, CZ – Czech Republic, DE – Germany, DK – Denmark, EE – Estonia, ES – Spain, FI – Finland, FR – France, GR – Greece, HR – Croatia, HU – Hungary, IE – Ireland, IT – Italy, LT – Lithuania, LU – Luxembourg, LV – Latvia, MT – Malta, NL – Netherlands, PL – Poland, PT – Portugal, RO – Romania, SE – Sweden, SI – Slovenia, SK – Slovakia, UK – United Kingdom.

Source: Authors' calculation.

If instead of the tax wedge the personal average tax rate is taken into account, lower standard deviation appears among variables in their belonging cluster, but Croatia still remains clustered among countries with a high tax burden and high labour market rigidity.

Important to point out is that a relatively high tax burden is a huge incentive for firms to work in the informal sector of the economy. This may be partially confirmed if the existence and size of gap between the registered and the LFS (based on ILO methodolo-

gy) unemployment rate is considered (see Appendix 3, Table A4). The average difference between the registered unemployment rate and the LFS unemployment rate for Croatia in the period between 2001 and 2008 is 5.5% which is much higher than the average of every other CEE country. It means that a large number of workers in Croatia are officially considered as unemployed and working for their employers without being registered. This might also occur when total labour costs are high as it is in the Croatian case (Nestić, 1998).

Previous results (Tables 3, 5 and 6) suggest that Croatia is clustered among countries with higher tax wedge (or higher personal average tax rate), higher employment protection legislation index, and higher unemployment rate (lower employment rate). But, such a wedge is not the total tax burden an average worker has to bear. According to Nickell (1997; 2004) the total tax rate (or total tax burden), measured as the sum of personal average tax rate (i.e. income tax plus social security contributions paid by employees) and consumption tax rates, represents a crude measure of the tax wedge between real labour costs and real take-home pay. If that is taken into account, on average, a Croatian worker in 2008 monthly paid approximately 17.86% of net earnings in VAT (see Appendix 4). Then the total tax rate, as in Nickell (1997; 2004) and OECD (2009), would end up at the level of 48.35% (for the 100% average wage level) instead of 30.49%.

If the total tax burden is considered, an average Danish worker bears the highest tax burden (65.9%), while an average Cypriot worker the lowest tax burden (20,05%) (Figure 9). The overall picture provides some important conclusions: (1) the highest tax burden from consumption is registered in Denmark (25.00%), Poland (21.18%) and Finland (20.40%); (2) countries with the lowest personal average tax rate register also a lowest consumption burden (mainly because these counties have some of the lowest standard VAT rates and one or more reduced rates); and (3) only in Ireland and Cyprus do average workers bear a high tax burden levied on consumption than that levied on labour[23]. Croatia takes the 10th place according to the total tax burden, but it is important to notice that the burden from consumption in the country is higher than in Slovenia, the Netherlands or even Belgium, in which the average worker bears a higher total tax burden.

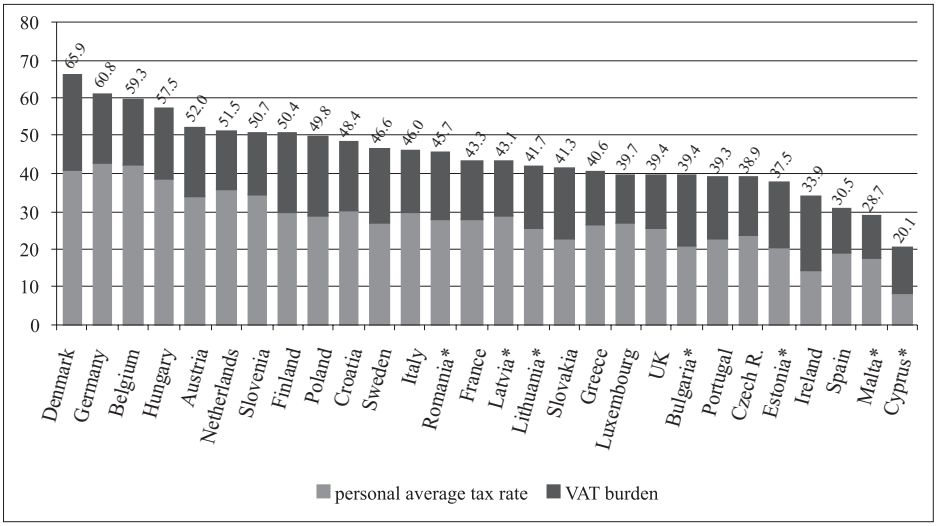
Figure 9 refers to data in 2008, and explicitly for Croatia to a standard VAT rate of 22%. In 2009, for the same reason that the "crisis tax" was introduced, this rate was raised by one percentage point, i.e. to 23%. This definitely resulted in one of the highest VAT standard rates as compared with EU member states[24]. If the new VAT rate is taken into account, then the consumption burden in Croatia will result in 18.63% (increase of 0.77 percentage points), and the overall burden will be 48.46%. Giving that other countries also changed their VAT law (although most of them reduced the standard rate, introduced new reduced rates or broadened the range of products for reduced rates; Latvia, Lithuania, Ireland and Hungary raised the standard VAT rate in 2009), Croatia would hold the same 10th position according to the total tax burden in 2009 also, but if the "crisis tax"

[23] It needs to be emphasised that consumption tax is represented only by VAT here. Introduction of other forms of consumption tax (mainly excises) would probably change the picture. However, that is out of the scope of this paper. VAT serves here only for illustrative purposes so we could show additional tax burden that an average worker carries.

[24] Only Denmark and Sweden have a higher VAT rate set at 25%.

is also taken into account it would move to the 9th position as compared with EU countries ranked according to the total tax burden.

Figure 9: Total tax burden for an average worker at 100% average wage level (% of gross wage) in 2008



**Data for 2007.*

Source: OECD (2009); Eurostat (2009); authors' calculations.

5 Conclusion and policy implications

This paper examines the theoretical relations between taxes on labour and labour market outcomes (employment and unemployment rates). The study shows that the reason for a high unemployment rate (or a low employment rate) can be found in the high tax wedge. Cluster analysis among EU countries plus Croatia showed that a high unemployment rate is evidenced in countries with a higher tax wedge, while a higher employment rate is registered in countries with a lower tax wedge. The same holds if instead of the tax wedge, the personal average tax rate is introduced. But this is not the general rule since there are countries in the EU that have a higher tax wedge (or tax rate) and a lower unemployment rate (higher employment rate). Therefore, a new variable (EPL index) is introduced into the analysis, in order to show that maybe some institutional characteristics are also responsible for the functioning of the labour market. In this case, Croatia belongs to a group of countries with higher tax burden, higher employment protection legislation index, and higher unemployment rate (lower employment rate). So, how much does the tax bite really hurt?

This paper demonstrates that in Croatia most of the labour tax burden is borne by employees, and not by employers. When the VAT rate is added to the tax wedge (personal average tax rate) the Croatian worker inclines even more towards the group of European workers with the highest total tax burdens. Consequently, because of the regressive ef-

fect of consumption taxes, the welfare of workers with the lowest wage decreases more than the welfare of those with higher wages. Therefore, the depth of the tax bite (when the overall tax burden is considered) is greater for Croatian workers of lower economic power, and certainly hurts them more. The deepest tax bite in EU countries is present in old members, while workers in the new members (except for Hungary and Slovenia) are "bitten" less. Worthy of mention is that the average gross wage is much higher in old than new member states plus Croatia, so the subjective perception of the depth of the tax bite is definitely higher in the new member states.

Besides the already large tax bite and bad situation in the labour market, Croatian workers experienced additional "bites" in 2009. Namely, in order to alleviate the consequences of the financial crisis on decreasing budgetary revenues, Croatian government opted for two fiscal measures in 2009: (1) increment of the VAT standard rate by one percentage point (from 22% to 23%); (2) introduction of the already mentioned "crisis tax", levied on the net wage and causing an additional burden for employees. These two measures may have improved budgetary revenues, but they have certainly worsened the welfare of an average worker in Croatia.

Perhaps the measures taken (VAT tax rate increase and introduction of "crisis tax") are not leading to an optimal solution. Maybe it would have been better if the VAT rate increment had been accompanied by an increase in the amount of personal allowance, which represents a "non-taxable" income category. Higher personal allowance is of more benefit to the welfare of lower-paid workers than, for example, a lower setting of income tax rates. That way a loss in personal income tax revenues (whose share in the total tax revenues in Croatia has constantly decreased since its introduction in 1994) would be compensated by an increase in VAT revenues, because a higher net wage would lead to higher consumption. Higher consumption would surely induce production and GDP in the end. The same effects, i.e. higher production and GDP, may be also obtained by lowering VAT on labour-intensive services in order to encourage entrepreneurship.

Another option for the Croatian government may be the reduction of social security contributions, as they take the greatest share in the total tax burden. But, the expenditure side of the budget needs to be taken into account also. Lower revenue from social security contributions would surely, at least in the short run, result in cuts on the budget's expenditure side. Since that the Croatian budget is "socially oriented", because of the fact that great part of the expenditures are addressed to socially endangered groups, lower revenues could even worsen the current situation. This is especially the case with contributions paid by employees and allocated for financing the pensions system, when one considers that the ratio of pensioners to insured worker was 1:1.5 in 2008 (HZMO, 2009).

All this leads to the conclusion that Croatia could possibly increase its labour supply and enhance welfare by lowering its tax burden. However, due to the high component of socially-oriented expenditures in the Croatian government budget, for the time being this is not likely to happen. In the end, this analysis should be considered as preliminary and as an insufficient basis for risky policy experiments, especially in countries with such precarious fiscal positions as Croatia. The safest way forward would clearly be to reduce expenditures before cutting taxes.

APPENDIX 1: Fundamentals of the personal income tax and social security contributions in Croatia in the period between 1994 and 2009

Table A1: The fundamentals of the personal income tax in Croatia in the period between 1994 and 2009

Period	Personal allowances in kuna[a]	Tax bracket I		Tax bracket II		Tax bracket III		Tax bracket IV	
		Tax base (up to)	Tax rate (%)	Tax base (from – to)	Tax rate (%)	Tax base (from – to)	Tax rate (%)	Tax base (from)	Tax rate (%)
Jan, 1994	332	3*PA	25	3*PA -	35				
Feb-Jun, 1994	400	3*PA	25	3*PA -	35				
Jul-Dec, 1994	500	3*PA	25	3*PA -	35				
1995-1996	700	3*PA	25	3*PA -	35				
1997-1998	800	3*PA	20	3*PA -	35				
1999	1,000	3*PA	20	3*PA -	35				
Jan-Mar, 2000	1,000	3*PA	20	3*PA -	35				
Apr-Dec, 2000	1,250	3*PA	20	3*PA -	35				
2001-2002	1,250	2*PA	15	2*PA - 5*PA	25	5*PA -	35		
2003-2004	1,500	2*PA	15	2*PA - 5*PA	25	5*PA - 14*PA	35	14*PA	45
2005-2007	1,600	2*PA	15	2*PA - 5*PA	25	5*PA - 14*PA	35	14*PA	45
Jan-Jun, 2008	1,600	2*PA	15	2*PA - 5*PA	25	5*PA - 14*PA	35	14*PA	45
Jul-Dec, 2008	1,800	2*PA	15	2*PA - 5*PA	25	5*PA - 14*PA	35	14*PA	45
2009	1,800	2*PA	15	2*PA - 5*PA	25	5*PA - 14*PA	35	14*PA	45

[a] *Personal allowance (PA) on a monthly basis for every worker without children or any dependants. Higher personal allowances available for pensioners or persons domiciled in the areas of special national concern are not considered here.*

Source: RIF (2009).

Table A2: Social security contributions in Croatia in the period between 1994 and 2009 (in %)

Period	Social security contributions paid by employees						
	Pension insurance	Health insurance	Occupational injuries	Employment	Child allowances	Water management	Total SSC employees
1995	12.75	7.00	1.90	1.90	2.20	-	23.85
Jan-Jul, 1996	12.75	7.00	1.90	1.90	2.20	-	23.85
Aug-Dec, 1996	12.75	7.00	0.85	0.85	2.20	-	22.80
1997	12.75	7.00	0.85	0.85	2.20	-	22.80
Jan, 1998	12.75	7.00	0.85	0.85	2.20	-	22.80
Feb-Jun, 1998	10.75	9.00	0.85	0.85	2.20	-	22.80
Jul-Dec, 1998	10.75	9.00	0.85	0.85	-	-	20.60
1999-2002	10.75	9.00	0.85	0.85	-	-	20.60
2003-2009	20.00	-	-	-	-	-	20.00
Period	**Social security contributions paid by employers**						
	Pension insurance	**Health insurance**	**Occupational injuries**	**Employment**	**Child allowances**	**Water management**	**Total SSC employers**
1994	13.50	7.50	-	-	0.80	0.80	22.60
1995	12.75	7.00	-	-	0.76	0.76	21.27
Jan-Jul, 1996	12.75	7.00	-	-	0.76	0.76	21.27
Aug-Dec, 1996	12.75	7.00	-	0.85	0.76	0.76	22.12
1997	12.75	7.00	-	0.85	0.76	0.76	22.12
Jan, 1998	12.75	7.00	-	0.85	0.76	0.76	22.12
Feb-Jun, 1998	10.75	9.00	-	0.85	0.76	0.76	22.12
Jul-Dec, 1998	10.75	9.00	-	0.85	-	-	20.60
1999	10.75	9.00	-	0.85	-	-	20.60
Jan-May, 2000	10.75	9.00	-	0.85	-	-	20.60
Jun-Dec, 2000	8.75	7.00	-	0.85	-	-	16.60
2001	8.75	7.00	-	0.85	-	-	16.60
2002	8.75	7.00	0.47	0.85	-	-	17.07
2003-2009	-	15.00	0.50	1.70	-	-	17.20

Source: RIF (2009).

APPENDIX 2: Data used in cluster analysis

Table A3: Tax wedge, employment and unemployment rate, personal average tax rate and EPL index in EU member states and Croatia in 2008 (in %)

Country	Employment rate	Unemployment rate	Tax wedge	Personal average tax rate	EPL index
Austria	72.1	3.9	48.8	33.9	2.2
Belgium	62.4	7.0	56.0	42.5	2.5
Bulgaria[a]	64.0	5.7	36.5	21.1	2.0[c]
Cyprus[a]	70.9	3.8	13.9	8.5	n.a.
Czech Republic	66.6	4.4	42.9	23.6	2.0
Germany	70.7	7.6	52.0	42.7	2.4
Denmark	78.1	3.4	41.2	40.9	1.8
Estonia[a]	70.7	5.6	38.7	20.2	2.3
Spain	64.3	11.4	37.8	19.0	3.0
Finland	71.1	6.4	43.5	30.0	2.0
France	64.9	7.4	49.3	27.8	2.9
Greece	61.9	7.8	42.4	26.3	2.8
Hungary	63.4	7.9	54.1	38.3	1.9
Ireland	67.6	6.1	22.9	14.6	1.3
Italy	58.7	6.8	46.5	29.3	2.4
Lithuania[a]	68.6	5.9	43.0	25.3	2.8[c]
Luxembourg	64.3	5.1	35.9	27.2	3.4
Latvia[a]	70.9	7.7	42.4	28.5	2.5[c]
Malta[a]	56.7	6.1	23.6	17.8	n.a.
Netherlands	55.3	2.7	44.9	36.1	2.1
Poland	59.2	7.2	39.7	28.6	2.2
Portugal	68.2	8.1	37.6	22.8	2.9
Romania[a]	59.0	6.1	43.3	27.8	2.8[c]
Sweden	74.3	6.3	44.6	26.7	2.2
Slovenia[b]	68.6	4.5	44.0	34.3	2.6
Slovakia	62.3	9.5	38.9	22.8	1.8
United Kingdom	71.5	5.7	32.8	25.6	1.1
Croatia	57.8	8.6	40.7	30.5	2.7[c]

[a] *Data for 2007 (for tax wedge and personal average tax rate).*
[b] *Data for 2006 (for tax wedge and personal average tax rate).*
[c] *Data for 2003.*

Source: Eurostat (2009); OECD (2009, 2010); Tonin (2005); Nešporová and Cazes (2006); Romih and Festić (2008); Eamets and Masso (2004); Authors' calculation.

APPENDIX 3: Registered and LFS unemployment rate

Table A4: Registered and LFS unemployment rate (in %), 2001-2008

	2001		2002		2003		2004		2005		2006		2007		2008	
	Registered	ILO	Registered	ILO	Registered	ILO	Registered	ILO	Registered	ILO	Registered	ILO	Registered	ILO	Registered	ILO
Czech Republic	8.9	8.1	9.8	7.3	10.3	7.8	9.5	8.3	8.9	7.9	7.7	7.1	6.0	5.3	-	-
Hungary	8.0	5.7	8.0	5.8	8.3	5.9	9.2	6.1	9.1	7.2	9.2	7.5	10.1	7.4	-	-
Poland	17.4	18.2	20.0	19.9	20.0	19.6	19.0	19.0	17.6	18.0	14.8	13.9	11.2	9.6	-	-
Slovakia	18.6	19.2	17.5	18.5	15.6	17.5	13.1	18.1	11.4	16.2	9.4	13.3	8.0	11.0	-	-
Slovenia	11.8	6.4	11.3	6.3	11.0	6.7	10.4	6.3	10.2	6.6	8.6	6.0	7.3	4.9	-	-
Bulgaria	17.3	19.7	16.3	17.8	13.5	13.7	12.2	12.0	10.7	10.1	9.1	9.0	6.9	6.9	-	-
Romania	8.8	6.6	7.8	8.4	7.2	7.0	6.3	8.0	5.8	7.0	5.2	7.2	4.1	6.4	-	-
Croatia	22.8	15.8	21.3	14.8	18.7	14.3	18.5	13.8	17.8	12.7	16.7	11.2	14.4	9.6	13.4	9.0

Source: Croatian National Bank.

APPENDIX 4: Consumption tax burden calculations

The intuition is to distribute the net wage among consumption products and services according to their share in total individual consumption (retrieved from Individual Consumption Survey results)[25]. This includes the following steps:

(1) Individual Consumption Survey results are retrieved from the Eurostat Official Web Site for EU member states and from the Croatian Bureau of Statistics for Croatia. This survey shows average shares in consumption for each country, according to which the net wage of an average worker at 100% wage level is distributed.

(2) Appropriate VAT rates for each country and each COICP[26] category are identified. Data of VAT rates for each EU member states are retrieved from the European Commission (2008 and 2009, for respective years) and for Croatia from the VAT Official Legislation. The appropriate rates are applied to suitable COICP categories and by summing up the paid VAT per category the total amount of VAT paid is obtained.

(3) The share of the obtained total VAT amount in the net wage is calculated. This share is the consumption tax burden an average worker actually bears.

Limitations of this methodology:

(a) Excise duties are not taken into account; therefore the consumption burden should be taken as an approximate measure.

(b) Reduced, super-reduced or zero rates are usually applied to a narrow set of goods or services. Therefore in some cases these "non-standard" rates are applied to the *whole amount of net wage spent on a particular COICP category* (i.e. on a broader range of goods and services), not just on the exact narrow set of goods and services on which they should have been (realistically) applied.

[25] Liabilities for debt or for savings are not taken into account and therefore the whole net wage is considered for consumption.

[26] COICP is meant for Classification of Individual Consumption by Purpose. It consists of 12 main categories of products and services.

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