

THE INFLUENCE OF THE TAX WEDGE ON UNEMPLOYMENT IN OECD COUNTRIES IN COMPARISON WITH CROATIA

Anamarija ŠEPAROVIĆ*
Zagrebačka banka, Zagreb

Article**
UDC 338.2
JEL H2, J30

Abstract

The tax wedge is the difference between the employer's labour costs and the net take-home pay of the employee. An increase in the tax wedge leads to an increase in the companies' labour costs and thus indirectly influences the level of unemployment. This article will try to answer these questions: Does the tax wedge affect the unemployment rate, how high is the tax wedge in Croatia in comparison with OECD countries, how does the tax wedge affect the unemployment rate in Croatia and would reducing the tax wedge be a solution to reduce unemployment? This article will show that Croatia is a country with a high tax wedge, which has negative affects on employment, and is partly "responsible" for the high unemployment. Thus, in dealing with unemployment problems, Croatia should work on its reduction.

Key words: tax wedge, unemployment rate, labour costs, Croatia, OECD.

1 Introduction

The tax wedge is the difference between the gross labour costs to the employer and the net "take-home" salary of the employee, that is the gross labour costs reduced by the mandatory contributions and prescribed taxes paid by the employer and the employee. An increase in the tax wedge increases the labour costs of a company, which is a key factor in decisions on employment, and so it indirectly affects the unemployment rate.

* Author thanks two anonymous referees for valuable comments and suggestions.

** Received: June 1, 2009

Accepted: December 12, 2009

Our starting point is the assumption that the tax wedge in Croatia is too large and that this is precisely one of the main reasons for high unemployment. This article will try to answer the following questions: does the tax wedge affect the unemployment rate? How large is the tax wedge in Croatia in comparison with OECD countries? How does the tax wedge affect the unemployment rate in Croatia, and is a cut in the tax wedge the right solution to reduce unemployment?

Similar research into the connection between the tax wedge and unemployment has already been undertaken (Elmeskov et al, 1998) where, using the regression method, the connection was examined between the tax wedge, but also some other factors, and the unemployment rate in OECD countries. The result of the research showed the significant influence of the tax wedge on the unemployment rate. In the period in question, the countries which reduced unemployment undertook political reforms which, amongst other things, also included a reduction in the tax wedge, and they led to a fall in unemployment. The authors assessed that in the period in question a reduction in the tax wedge of 7% could lead to a reduction in the unemployment rate of about 0.7 percentage points.

In this article, using descriptive, discriminant and cluster analysis, with figures from OECD countries, it will also be shown that the tax wedge affects the unemployment rate, and that its reduction would also reduce unemployment, or increase employment. It will also be seen that the OECD countries may be categorised into two groups depending on their tax wedge and unemployment rate. The first group comprises countries with a low tax wedge and a low unemployment rate, whilst the second group comprises those with a large tax wedge and a high unemployment rate. This analysis has already been used (Dolenc, 2005), where the authors, using these methods, confirmed the interdependence of the unemployment rate and the tax wedge. In order to include Croatia in the analysis, these analyses were also used in this study. The research will show that Croatia comes into the second group, that is, it has a high tax wedge, which has a negative effect on employment and that this is partially “responsible” for the high unemployment rate. Therefore, in resolving the problem of unemployment in Croatia, work should be done to reduce it.

After the introduction, we present the methodology used and the source of data, and in the third chapter there is an overview of the tax wedge in Croatia. In the fourth chapter an analysis is made for OECD countries of their tax wedge and unemployment rates, which will confirm or refute the hypothesis of the connection between the tax wedge and the unemployment rate. After that the tax wedge in Croatia is compared with OECD countries and finally there is a conclusion.

2 Methodology and source of data

2.1 Methodology

The tax wedge is the difference between labour costs and net take-home pay calculated in relation to the total labour costs, or as a formula it would look like this:

$$PK = \frac{BRTR - NTP}{BRTR} \quad (1)$$

where TW is the tax wedge, GRLC is the gross labour costs and NTP is net take-home pay.

The tax wedge shows the amount of payments to the state within the total labour cost. Payments to the state are prescribed by laws and are therefore different for each country. Tax obligations and mandatory contributions vary for different types of tax payers. They depend on the level of the salary of the employee, where they live and the number of dependents which affect the personal allowances of the tax payer. So, in order for us to be able to calculate the tax wedge we have to define the “average worker” in Croatia. The OECD defines the “average worker” as one employed in sectors C-K. In order to compare the results gained for Croatia with OECD countries, we will use precisely that definition of the “average worker”. We will look at three different types of employee, depending on income:

- individuals with 67% (2/3) income of AW
- individuals with 100% income of AW
- individuals with 167% (5/3) income of AW

We will only consider single people, that is individuals without children or dependents. For the sake of comparison with the OECD, we will assume that their salary is their only source of revenue, that they have no additional life premiums for life, health or pension insurance and that they live in Zagreb¹.

For an analysis of the interdependence of the tax wedge and the unemployment rate, we will use descriptive, cluster and discriminant analysis².

The hierarchical cluster analysis used in this study is a way of studying a grouping of data, simulated on a diverse scale, creating a cluster tree. The tree does not represent one group but a multi-layered hierarchy, so that the groups on the lower level are re-grouped into groups on a higher level etc. In order to calculate the distance of the data the Euclid norm was used, and to calculate their proximity, that is the similarity of the data, Ward’s method was used. As a result of this analysis we obtain a dendrogram, a graph showing the hierarchical cluster tree. On the x axis are the numbers of the subjects, whilst on the y axis the distances are shown calculated in the previous step. The connection between the subjects is shown in the lines in the shape of the letter U. The height of the U shows the distance between the subjects. The smaller the distance, the closer the subjects are, that is more similar, and the greater the distance between the subjects they are farther apart, that is more different.

Discriminant analysis is an analytical method by which multi-factor data m variables, are compared in k previously defined groups, using a linear combination of variables. When the data are arranged into two groups the value of the discriminant function is the value: <0 , for data from the first group; and >0 for data from the second group.

¹ Surtax for the City of Zagreb (18%) is the highest in Croatia (municipalities $\leq 10\%$, towns $\leq 15\%$), and it would be better to use a weighted surtax, but the effect of surtax on the total tax burden is relatively small, 1.4% of the gross labour costs, and taking the average surtax would not have a significant effect on the tax wedge, e.g. a change in surtax of 10% would reduce the tax wedge of AW by 64 b.p.

² These analyses were used by Dolenc, 2005 for researching the effect of the tax wedge on unemployment in Slovenia.

2.2 Source of data

The analysis in this study uses two sources of data.

- For calculation of the tax wedge in Croatia, the official data were used from the Croatian Central Bureau for Statistics on average salaries and data on the unemployment rate for further analysis and comparison with OECD countries
- For comparison of the tax wedge with OECD countries data was used from their annual report *Taxing Wages 2007/2008* (OECD 2008) and data on unemployment taken from OECD.Stat 2009, that is the OECD database.

3 The tax wedge in Croatia

The tax wedge in Croatia is calculated for an “average worker” defined as the tax wedge for the three types of employees. The tax wedge is calculated as the difference between the labour costs and net take home pay calculated in relation to the total costs of labour. In this way the tax wedge in Croatia is obtained for 2007 of 38.4%, for a single person with 67% of the income of the AW, 41.1% for a single person with 100% of the income of the AW and 45.4% for a single person with 167% of the income of the AW. Later it will be seen that this is quite a high tax wedge in comparison with other countries.

Table 1 The ratio of contributions and taxes in the gross labour costs

	Single person with 67% income of AW	Single person with 100% income of AW	Single person with 167% income of AW
Gross labour costs	100	100	100
Net salary	61.56	58.88	54.58
Contributions paid by the employee	17.06	17.06	17.06
Contributions paid by the employer	14.68	14.68	14.68
Surtax and income tax	6.70	9.38	13.68

Source: author's calculation

Table 1 shows the share of contributions and taxes in the total gross labour costs. The greatest expenditure, as can be seen, is on mandatory contributions paid by the employee, followed by the mandatory contributions paid by the employer. The smallest sum is the share of surtax and income tax. Since surtax and income tax are paid by the employee, we see that in Croatia the greatest burden is borne by the employee. The share of mandatory contributions paid by the employee and the employer are fixed, that is they do not depend on the level of the salary of the employee, and they amount to 17.06% and 14.68%. Surtax and income tax are variable and grow with the increase in the gross salary of the employee. For our three types of employee they amount to 6.70%, 9.38% and 13.68%.

4 The tax wedge in OECD countries

4.1 Descriptive analysis

In Table 2 the tax wedge is shown for OECD countries for 2007, calculated in relation to the total labour costs. Data is also included on unemployment in those countries calculated as the relationship between the unemployed and the total active population. There are also data for Croatia, for the sake of comparison, however they are not included in the analysis. The data are sorted in ascending order by size of the tax wedge for a single person with the wage of an AW.

Table 2 The tax wedge in relation to gross labour costs and the unemployment rate in relation to the active population for OECD countries in 2007

Country	Single person with 67% income of AW	Single person with 100% income of AW	Single person with 167% income of AW	Unemployment rate ^a
Mexico	11.10	15.91	21.98	3.4
Korea	16.79	19.68	22.50	3.2
New Zealand	19.09	21.54	27.29	3.6
Ireland ^b	15.73	22.75	33.74	4.6
Australia	23.72	27.72	32.81	4.4
Iceland	23.37	28.12	31.92	2.3
Japan	27.80	29.32	32.39	3.9
USA	27.54	29.68	34.95	4.6
Switzerland	26.97	29.74	34.06	3.6
Canada	26.49	31.20	32.89	6.0
United Kingdom	30.62	34.01	37.78	5.4
Luxemburg	29.91	36.30	43.02	4.4
Norway	34.17	37.54	43.14	2.5
Portugal	32.99	37.68	43.45	8.0
Slovakia	35.64	38.57	40.56	11.0
Spain	35.65	38.95	42.40	8.3
<i>Croatia</i>	<i>38.44</i>	<i>41.12</i>	<i>45.42</i>	<i>14.8</i>
Denmark	39.32	41.38	49.74	3.7
Greece	36.74	42.30	47.56	8.1
Turkey ^b	41.84	42.74	44.54	9.6
Poland	41.77	42.91	43.82	9.6
Czech Republic	40.60	42.94	46.78	5.3
Finland	38.16	43.59	49.49	6.9
The Netherlands	40.67	44.26	46.06	3.3
Sweden	43.28	45.32	53.04	6.1
Italy	42.58	46.24	51.18	6.2
Austria	44.13	48.58	50.73	5.1
France	45.44	49.23	53.11	8.0
Germany	47.75	52.60	53.26	8.3
Hungary	46.02	54.53	58.62	7.4
Belgium	50.01	55.77	61.01	7.4
Average without Croatia	33.86	37.70	42.13	5.8

^a The ratio of unemployment in the total active population.

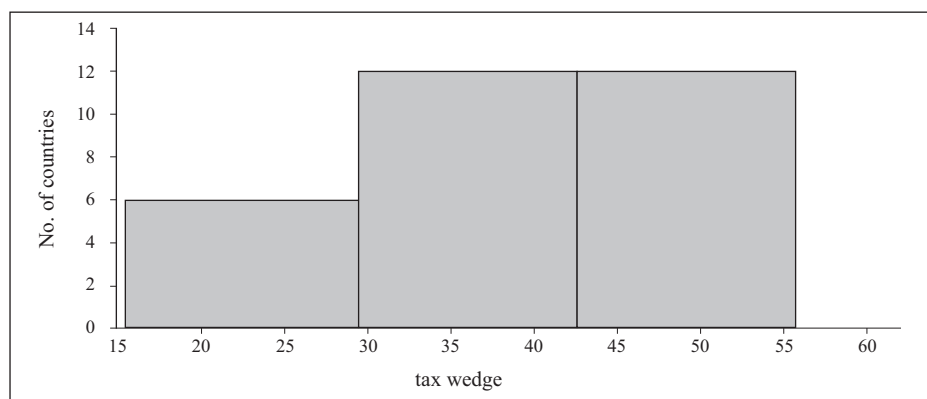
^b Using the old definition of AW, that is a work employed in sector D.

Source: for tax wedge - OECD (2008); for unemployment - OECD (2009); for Croatia - DZS

From the Table it may be seen that the tax wedge in OECD countries is very varied, which is to be expected due to the large differences between them. The smallest tax wedge is in Mexico (from 11.1 to 22.0) and the largest in Belgium (from 50.0 to 61.0), whilst the average of all OECD countries is from 33.9 to 42.1, that is the range of the tax wedge is quite large. From the table it may also be seen that all the OECD countries and Croatia as well, have a progressive tax wedge, that is, with the increase in income, the tax wedge also increases. In this way employees with lower incomes are protected and the greater tax burden is transferred to the “wealthier” employees, that is, employees with larger incomes. The unemployment rate in OECD countries is also quite varied, from 2.4% in Mexico to 11.0 % in Poland, and the average is 5.8%. In further analyses we will consider a single person with 100% of the income of an AW as the representative sample.

By dividing the range of tax wedge in OECD countries into three equal parts, we obtain the following three classes: countries with a low tax wedge – Mexico, Korea, New Zealand, Ireland, Australia and Iceland; countries with a medium sized tax wedge – Japan, the USA, Switzerland, Canada, the United Kingdom, Luxembourg, Norway, Portugal, Slovakia, Spain, Denmark, and Greece; and countries with a high tax wedge – Turkey, Poland, Czech Republic, Finland, the Netherlands, Sweden, Italy, Austria, France, Germany, Hungary and Belgium.

Figure 1 Histogram of the three classes of OECD countries



Source: Table 2

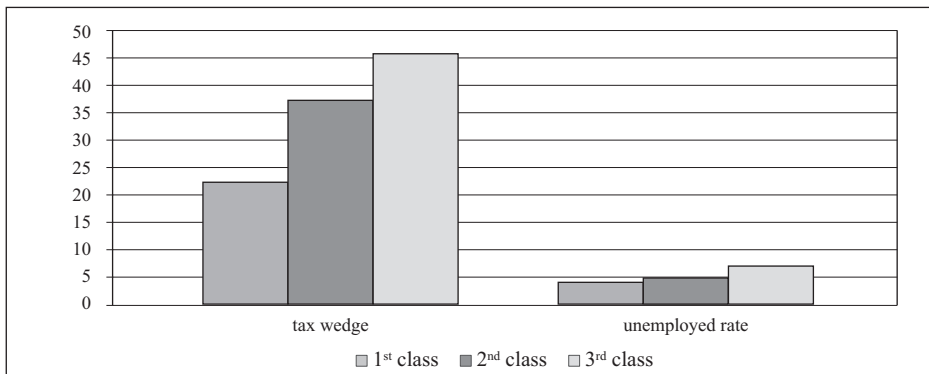
In order to see whether the low tax wedge corresponds to a low unemployment rate and a high tax wedge to a high unemployment rate, the medians of the three classes are calculated.

The median tax wedge by class is 22.1; 36.9 and 45.8 and the median unemployment rate is 3.5; 5.0 and 7.2. We can see that in the group with a lower tax wedge the unemployment rate is also lower, whilst in the group with the higher tax wedge the unemploy-

ment rate is also higher, so it may be concluded that the tax wedge affects the unemployment rate.

Whether the tax wedge affects unemployment, how and by how much, may also be tested by calculating the coefficient of the correlation of the tax wedge and the unemployment rate. The correlation coefficient for OECD countries is $+0.568$, which means that the variables are positively correlated. The p-value is 0.0011 (<0.05), that is with great probability (0.99) the hypothesis can be rejected that these two variables are not correlated, and it may be said that the correlation is significant.

Figure 2 The medians of the three classes



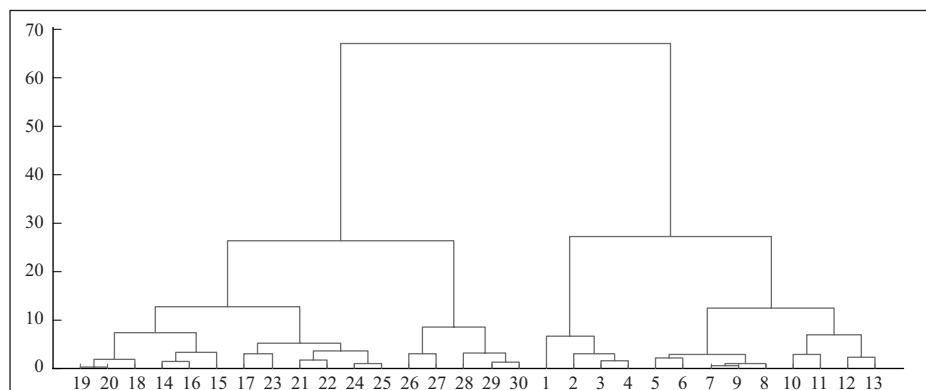
Source: Table 2

Therefore, descriptive analysis confirms the hypothesis that the tax wedge and the unemployment rate are connected.

4.2 Cluster analysis

The hierarchical cluster analysis could show which countries are similar in terms of the tax wedge and the unemployment rate, and thereby also show whether those two variables are interrelated. Cluster analysis for OECD countries resulted in the following dendrogram:

Figure 3 Dendrogram of cluster analysis of OECD countries



Source: author's calculation; using MATLAB functions

The values on the x axis are the ordinal numbers of the OECD countries as follows: 1–Mexico, 2–Korea, 3–New Zealand, 4–Ireland, 5–Australia, 6–Iceland, 7–Japan, 8–USA, 9–Switzerland, 10–Canada, 11–United Kingdom, 12–Luxembourg, 13–Norway, 14–Portugal, 15–Slovakia, 16–Spain, 17–Denmark, 18–Greece, 19–Turkey, 20–Poland, 21–Czech Republic, 22–Finland, 23–The Netherlands, 24–Sweden, 25–Italy, 26–Austria, 27–France, 28–Germany, 29–Hungary, 30–Belgium. Whilst the y axis shows the Euclid distance from the centre of the cluster.

We can see that the most similar in pairs are Turkey and Poland, Japan, the USA and Switzerland, Sweden and Italy etc. However, what is even more interesting is the fact that the countries are divided into two groups. The first group is countries numbered 1 to 13, and the second countries from 14 to 30. In the following table a more detailed description is given of those two groups.

Table 3 The characteristics of two groups of OECD countries obtained by cluster analysis

Group	Tax wedge	Unemployed rate
1 (n=13)	26.7 ± 10.8	4.2 ± 1.9
2 (n=17)	46.7 ± 9.0	7.2 ± 3.8
Total	35.8 ± 19.9	6.7 ± 4.4

From Table 3 it is visible that the first group has a smaller tax wedge and a lower unemployment rate than the second group. This result again confirms the hypothesis of the interdependence of the tax wedge and the unemployment rate.

4.3 Discriminant analysis

Using the classification gained by cluster analysis, discriminant analysis was performed for OECD countries. The function of discriminant analysis obtained³ is:

$$z = -7.314 + 0.144 pk + 0.323 sn, \quad (5)$$

Where z are the discriminant function values, tw the tax wedge and ur the unemployment rate.

The discriminant function value of countries in the group with a small tax wedge and low unemployment rate is negative, whilst for countries in the group with a large tax wedge and high unemployment rate it has positive value. The discriminant function divides countries into the same groups as the cluster analysis, except Denmark. That is to say, the discriminant function value for Denmark is -0.16, and therefore it falls into the group of countries with a low tax wedge and a low unemployment rate, but it still has a small value and it may be said that Denmark is on the boundary between the two groups. The discriminant function obtained by this analysis will be used later to see in which group the discriminant analysis places Croatia.

5 The tax wedge in Croatia in view of the OECD

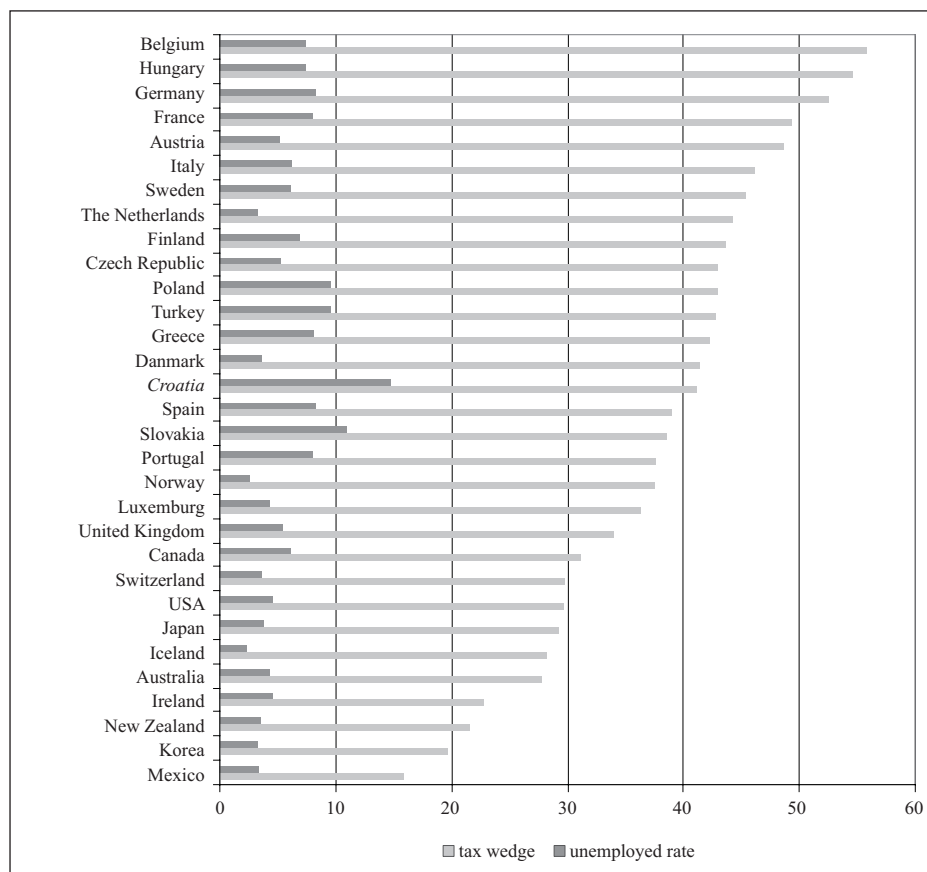
Now since the hypothesis has been confirmed on the interdependence of the tax wedge and the unemployment rate, we will consider how large the tax wedge and the unemployment rate are in Croatia in comparison with OECD countries, and into which group Croatia would fall.

It is clear that Croatia is somewhere in the middle in terms of OECD countries, however it has quite a high unemployment rate. The average tax wedge for OECD countries is 37.7%, the tax wedge in Croatia is a little larger than that average (41.1%) so it could be said that Croatia has a relatively high tax wedge. However, looking at the unemployment rate, the situation in Croatia is quite worrying. That is to say, the range of unemployment rates in OECD countries is from 2.3 to 11.0%, and the average is 5.8%, whilst the registered unemployment rate in Croatia is 14.8%. Therefore, although the tax wedge in Croatia is slightly higher than the average, the unemployment rate is much higher than in OECD countries. EU members who are also members of the OECD have on average a much greater tax wedge than the total average of the OECD (38.8, 43.0, 47.6) and Croatia has a slightly lower tax wedge than the EU members. Research by the European Commission shows that EU members⁴ have been working since 2000 on reducing their tax wedge, and it was falling right up until 2005, when the fall came to a halt (European Commission, 2008).

³ My own calculation: functions used in SPSS.

⁴ EU-25, EU members in 2006

Figure 4 The tax wedge in OECD countries and Croatia



Source: Table 4

OECD countries will again be divided into three equal classes, as before, that is, those with low, medium and high tax wedges, but now including Croatia. This analysis places Croatia in the group with the medium sized tax wedge, which also includes Japan, the USA, Switzerland, Canada, the United Kingdom, Luxembourg, Norway, Portugal, Slovakia, Spain, Denmark and Greece. However the range of the medium class is from 29.2% to 42.5% and it is visible that Croatia is close to the boundary with the third class, that is the group with a high tax wedge.

As has already been said, the tax wedge consists of contributions and taxes paid by the employee and the employer. Table 4 shows the share of contributions and taxes in the total gross labour costs in Croatia and OECD countries.

Table 4 The share of contributions and taxes in the gross labour costs in Croatia and OECD countries

Country	Taxes paid by employee^a	Contributions paid by employee	Contributions paid by employer	Payroll tax^b	Tax wedge
Mexico	4.1	1.3	10.6	0.0	15.9
Korea	4.3	6.7	8.7	0.0	19.7
New Zealand	21.5	0.0	0.0	0.0	21.5
Ireland ^c	8.4	4.7	9.7	0.0	22.7
Australia	22.1	0.0	0.0	5.7	27.7
Iceland	22.9	0.2	5.1	0.0	28.1
Japan	7.1	10.7	11.5	0.0	29.3
USA	15.4	7.1	7.2	0.0	29.7
Switzerland	9.8	10.0	10.0	0.0	29.7
Canada	14.2	6.6	10.4	0.0	31.2
United Kingdom	15.9	8.3	9.7	0.0	34.0
Luxemburg	13.8	10.6	11.9	0.0	36.3
Norway	19.3	6.9	11.3	0.0	37.5
Portugal	9.6	8.9	19.2	0.0	37.7
Slovakia	7.2	10.6	20.8	0.0	38.6
Spain	10.9	4.9	23.2	0.0	38.9
Denmark	30.3	10.5	0.6	0.0	41.4
Greece	7.9	12.5	21.9	0.0	42.3
Turkey ^c	12.7	12.3	17.7	0.0	42.7
Poland	5.5	20.5	17.0	0.0	42.9
Czech Republic	7.8	9.3	25.9	0.0	42.9
Finland	18.8	5.4	19.4	0.0	43.6
The Netherlands	13.0	18.0	13.2	0.0	44.3
Sweden	15.5	5.3	21.2	3.3	45.3
Italy	14.8	7.2	24.3	0.0	46.2
Austria	12.0	14.0	16.7	5.8	48.6
France	9.9	9.6	29.7	0.0	49.2
Germany	18.4	17.6	16.6	0.0	52.6
Hungary	16.2	12.6	23.8	1.9	54.5
Belgium	21.7	10.7	23.4	0.0	55.8
Average	13.7	8.8	14.7	0.6	37.7
Croatia	9.4	17.1	14.7	0.0	41.1

^a *Income tax and surtaxes*

^b *Paid by employer.*

^c *Old definition of AW used, that is worker employed in sector D*

Source: for OECD countries (OECD, 2008), for Croatia, the author's calculations

It is visible that the tax wedge systems in OECD countries differ, which is the result of the differing political characteristics of member countries. In most OECD countries, as well as in Croatia, the tax wedge consists of taxes and contributions paid by the employ-

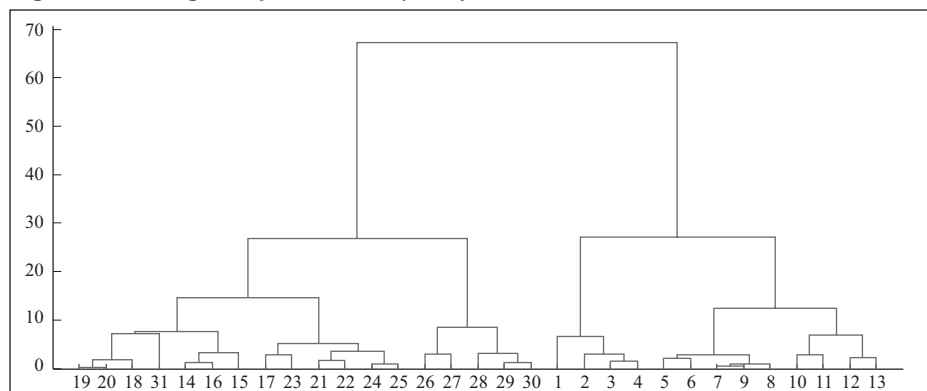
ee and contributions paid by the employer. But some OECD countries also have a payroll tax which is paid by employers. For a better comparison of the share of expenses, the tax wedge will be divided into the part paid by the employee and the part paid by the employer. The share of expenses paid by the employee in Croatia amounts to 26.4% and in OECD countries 22.5%, whilst the share of costs for employers in Croatia is 14.7% and in OECD countries 15.2% of the gross costs of labour. Therefore, looking at the tax wedge system in Croatia, the burden on the employee is greater than in OECD countries whilst the burden on the employer is less than in OECD countries.

The question arises whether it is better for the burden to be on the employer or the employee. If the burden is borne by the employee, it may have differing results. The discouraging results of progression are well known, that is the effect of substitution (in this case work for leisure). The negative effect on the supply of work may be further increased where low incomes interact with a variety of payments from various social transfers and privileges (Blažić, 2006, p. 121). Precisely employees with low wages and low qualifications are most hit by a high unemployment rate, therefore in the middle of the 1990's some EU members (Austria, Belgium, France, Greece, the Netherlands and Spain) focused on those groups and reduced the tax wedge for them (Journard 2001.).

If the burden is not borne by the employee but by the employer, this could be motivation for the employer to substitute work for capital, reduce production or relocate production to another country with lower labour costs. Furthermore, it is thought that the positive effect on demand for labour comes precisely from payments which are formally borne by the employer, that is contributions paid by the employers. That is to say, contributions by employers reduce the after tax wage to which the gross wage may react slowly (in the sense of increasing – that is to transfer of the burden to the employer – or even not), whilst an increase in contributions by employers directly increases the costs of labour (OECD, 2001, pp. 27, 52). So, exclusively burdening the employer or the employee has negative effects and it is necessary to find a balance between the burdens.

Cluster analysis, including Croatia, produces the following dendrogram.

Figure 5 Dendrogram of cluster analysis of OECD countries and Croatia



Source: author's calculations, using MATLAB function

The values on the x axis are the ordinal number of the OECD countries, the same as before, that is: 1–Mexico, 2–Korea, 3–New Zealand, 4–Ireland, 5–Australia, 6–Iceland, 7–Japan, 8–USA, 9–Switzerland, 10–Canada, 11–United Kingdom, 12–Luxembourg, 13–Norway, 14–Portugal, 15–Slovakia, 16–Spain, 17–Denmark, 18–Greece, 19–Turkey, 20–Poland, 21–Czech Republic, 22–Finland, 23–The Netherlands, 24–Sweden, 25–Italy, 26–Austria, 27–France, 28–Germany, 29–Hungary, 30–Belgium with the addition of Croatia as 31.

It may be seen that Croatia, with a tax wedge of 41.1% and an unemployment rate of 14.8%, is most similar to Greece, Turkey and Poland in the cluster analysis. Those are the countries with have a tax wedge larger than Croatia (42.3, 42.7, 42.9), but a lower unemployment rate than Croatia (8.1, 9.6, 9.6). Although they have a lower unemployment rate than Croatia, those are countries with a high unemployment rate, that is they have a rate somewhat higher than the average for OECD countries.

As before, the cluster analysis of all countries is divided into two groups. The first group, with a small tax wedge and low unemployment rate, is the same as before, whilst Croatia is now included in the second group. Therefore, it may be concluded that Croatia is a country with a high tax wedge and a high unemployment rate.

In order to check if the cluster analysis has included Croatia correctly in the countries with a high tax wedge and a high unemployment rate, we undertake further discriminant analysis. The discriminant function is used that was obtained in the discriminant analysis of OECD countries, that is formula (5). For Croatia it amounts to $z=3.39$, i.e. it places Croatia in the group with a large tax wedge and a high unemployment rate. The value of the discriminant function is quite large due to the high unemployment rate.

6 Conclusion

It has been seen that “a connection exists” which indicates the mutual causation of the tax wedge and unemployment, that is a high tax wedge brings with it a high unemployment rate. A high tax wedge has a negative effect on the employee and the employer by increasing unemployment. That is to say, a high tax wedge demotivates employees in seeking work due to the large payments to the state and the small net wage, and also partially due to the payments they receive while they are unemployed. This problem is seen most clearly in people with low wages, when the difference between wages and unemployment benefits is small. A high tax wedge also increases the costs of labour, which demotivates employers in employing new workers. On the other hand a low tax wedge has the opposite effect. So a low tax wedge encourages employees to find work due to the increase in the net wage itself, but also employers to seek new workers due to the lower labour costs.

It has been seen that unemployment is a major problem in Croatia, but the unemployment rate used in this study is the registered unemployment rate, and does not give a true picture of employment in Croatia. That is to say, it would perhaps be better to consider the survey rate, which is quite low for Croatia (in the last quarter of 2007 it was 9.7%, in the third quarter of 2008 7%). But for the sake of comparison with OECD countries, the registered unemployment rate was used in the study. In further research it would be use-

ful to extend the methodology and compare the survey unemployment rate for OECD countries and Croatia. Also further research could be extended to assess what the effect of the tax wedge could be on unemployment.

At the beginning of this study it was assumed that precisely a large tax wedge was a cause of high unemployment. Looking at the situation in Croatia, this was indeed probably one of the major causes, but over the last few years changes have been introduced to the tax burden which have reduced the tax wedge. The largest changes in the taxation of labour in Croatia happened at the beginning of the 1990's when a foundation was set which is still used today. From 1994 to 2005 further changes were introduced, such as an increase in personal allowances, increases in the coefficient of personal allowances for maintenance of dependent family and children and for the areas of special state concern, and for socially endangered citizens, changes to tax rates and classes, and changes to the amounts and structure of mandatory contributions by employers and employees (Petrović, 2007). So in 1994 the tax wedge was more than 50%, in 1997 about 45% and in 2005 39.5%. However the tax wedge in Croatia is still quite large and work should be done to reduce it.

Reduction of the tax wedge could be performed in several ways, for example by increasing personal allowances, reducing income tax, reducing contributions on income, reducing contributions by employers and employees etc. The problem in Croatia is not income tax, which is relatively low in relation to other countries, but contributions, especially contributions paid by employees, where Croatia has one of the largest burdens in the world. But a reduction in contributions is closely related to reforms of the health and pension insurance systems (Kesner-Škreb 2007.).

An increase in personal allowances would reduce payments by the employee, which would mostly help employees in the areas of special state concern and families with children and also, apart from reducing the tax wedge and increasing employment, would probably have a positive effect on the birth rate in Croatia. Croatia made precisely this move in 2008, that is personal allowances were increased from 1600 to 1800 kuna a month. The increase in personal allowances mainly led to a decrease in the tax wedge of workers with children and workers in the areas of special state concern. The tax wedge for December 2008 in Croatia amounted to: 38.41, 40.99 and 45.36⁵, so the changes in relation to 2007 are: -4bps, -13bps, -6bps, whilst the registered unemployment rate for 2008 was 13.2⁶, so unemployment fell in that year by 1.6 percentage points.

LITERATURE

Blažić, H., 2006. *"Usporedni porezni sustavi – Oporezivanje dohotka i dobiti"*. Rijeka: Ekonomski fakultet Sveučilišta u Rijeci.

Dolenc, P. and Vodopivec, M., 2005. "Does work pay in the Republic of Croatia?". *Financial theory and practice*, 29 (4), 399-420.

⁵ Employee with 67%; 100%; 167% income of AW.

⁶ Source: CBS 2009.

Dolenc, P. and Vodopivec, M., 2005. “The tax wedge in Slovenia: international comparison and policy recommendations”. *Financial theory and practice*, 29 (3), 283-297.

DZS, 2008. *Statističke informacije 2008*. Zagreb: Državni zavod za statistiku.

DZS, 2009a. *Statističke informacije 2009*. Zagreb: Državni zavod za statistiku.

DZS, 2009b. *Priopćenje br. 9.1.2-12. – Prosječne mjesečne bruto plaće za prosinac 2008*. Zagreb: Državni zavod za statistiku.

Elmeskov, J., Martin, J. and Scarpetta, S., 1998. “Key lessons for labour market reforms: evidence from OECD countries’ experiences”. *Swedish Economic Policies Review*, 5 (2), 205-252.

European Commission, 2008. *Taxation trends in the European Union – Main Results* [online]. European Commission. Available from: [www.ec.europa.eu/index_en.htm]

IJF, 2006. *Plaća – primitak iz radnog odnosa*. Zagreb: Institut za javne financije.

Joumard, I., 2001. “Tax system in European Union countries”. *OECD Economics Working Paper*, No. 301.

Kesner-Škreb, M., 2007. “What to do with taxes in Croatia? Tax burden, taxation of income, profit and property” [online]. *Newsletter*, No. 32. Available from: [http://www.ijf.hr/eng/newsletter/36.pdf].

Ministarstvo financija 2009. *Zakoni i propisi*. Zagreb: Ministarstvo financija.

OECD, 2001. “Tax and the Economy”. *Tax Policy Studies* No. 6. Paris: OECD.

OECD, 2008. *Taxing Wages 2007/2008*. Paris: OECD.

OECD, 2009. *SourceOECD: OECD.Stat* [online]. Paris: OECD. Available from: [www.oecd.org].

Petrović, S., 2007. “Porez na dohodak i doprinosi za socijalno osiguranje u Hrvatskoj, 1994.-2007”. *Revija za socijalnu politiku*, 14 (3) 415-426.

Timm, Neil H., 2002. *Applied multivariate analysis*. New York: Springer.