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Unemployment and Labour Market Rigidities in OECD Countries – The Impact of Taxes

by

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Abstract:

This paper investigates unemployment and labour market rigidities in OECD countries in 1983–1994. The central issue is the taxation-unemployment relationship and whether this relationship is exogenous or simultaneously determined. Hausman specification tests indicate that the impact of taxation on short-term unemployment is positive and exogenous whereas the relationship between taxation and long-term unemployment is simultaneously determined. Correcting for this simultaneity results in a much higher, significant and positive regression coefficient for the impact of taxation. Thus, high taxation seems to be one of the main determinants of long-term unemployment.

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1.   Introduction

Unemployment rates in OECD countries differ widely. To explain this variety the impact of labour market rigidities has been analyzed in numerous studies. The main interest was in direct rigidities of the labour market, in the treatment of the unemployed and in the structure of the wage bargaining system. It has been empirically demonstrated that labour market rigidities can explain a significant part of the observed international variety in unemployment rates (Layard, Nickell and Jackman 1991).

The primary interest of the present paper is in the tax burden on labour. This characteristic of the labour market has only recently attracted special attention and proved to be an additional significant determinant in international comparisons of unemployment rates (e.g. Nickell 1997).[1] Since high unemployment rates may (also) lead to higher government expenditures (and taxes) the question is whether the impact of the tax burden on unemployment has been estimated correctly, i.e. whether the estimates are consistent and unbiased.

To solve this possible problem a Hausman specification test can be carried out (Hausman 1978). With the help of this test it is possible to investigate whether the impact of the tax burden on unemployment can be considered as exogenous. If the outcome of this test is that the null hypothesis (that taxes are exogenous) has to be rejected, a two-stage least squares estimation procedure can provide unbiased and consistent estimates of the tax burden's impact on unemployment and thus correct for the simultaneity bias.

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[1]   See also the contributions of Scarpetta (1996), Nickell and Layard (1997), Heitger (1998) and Elmeskov et al. (1998).

The empirical investigation will focus on total unemployment but also on long-term and short-term unemployment. The reason is that an increase in long-term unemployment will eventually create a larger effect on government expenditures (and taxes) than will do an increase in short-term unemployment. Since the tax burden is assumed to be only one of the structural features of the labour market in OECD countries the impact of the other determinants has also to be estimated. The investigations are based on the data set of Nickell (1997) which contains the relevant data for two periods, namely 1983–1988 and 1989–1994.

The outline of the paper is as follows. Sections 2 and 3 briefly summarize the unemployment performance and some labour market rigidities in OECD countries in 1983–1994.[2] The next three sections present empirical evidence about the relationship between labour market features and total, short-term and long-term unemployment rates. It is also investigated whether taxes are endogenous and – if necessary – an alternative estimation procedure is employed. In section 7 the relative importance of taxation as a determinant of unemployment is evaluated. Conclusions are drawn in the last section.

2.   Unemployment Performance in OECD Countries

Unemployment rates in OECD countries differ widely (Table 1). The rate of total unemployment in 1983–1988 in Spain was 19.6 per cent while the rate in Switzerland was only 0.8 per cent. In 1989–1994 these two countries again reported the highest (18.9 per cent) and the lowest (2.3 per cent) unemployment rate. The OECD average rate of total unemployment in the course of time only rose slightly from 7.8 per cent to 8.0 per cent. Total unemployment in Europe was

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[2]   For more details see Nickell (1997).

higher than in non-European countries in both periods. In Europe in 1983–1988 the rate was 8.2 per cent compared with 6.6 per cent for non-Europe. In 1988–1994 the difference reduced to 1.1 percentage points. At the same time the variation of total unemployment rates increased.

Table 1:   Unemployment Rates in OECD Countries, 1983–94

	1983–88			1989–94		
	Total	Short-term	Long-term	Total	Short-term	Long-term
Austria	3.6	na	na	3.7	na	na
Belgium	11.3	3.3	8.0	8.1	2.9	5.1
Denmark	9.0	6.0	3.0	10.8	7.9	3.0
Finland	5.1	4.0	1.0	10.5	8.9	1.7
France	9.8	5.4	4.4	10.4	6.5	3.9
Germany (W)	6.8	3.7	3.1	5.4	3.2	2.2
Ireland	16.1	6.9	9.2	14.8	5.4	9.4
Italy	6.9	3.1	3.8	8.2	2.9	5.3
Netherlands	10.5	5.0	5.5	7.0	3.5	3.5
Norway	2.7	2.5	0.2	5.5	4.3	1.2
Portugal	7.6	3.5	4.2	5.0	3.0	2.0
Spain	19.6	8.3	11.3	18.9	9.1	9.7
Sweden	2.6	2.3	0.3	4.4	4.0	0.4
Switzerland	0.8	0.7	0.1	2.3	1.8	0.5
U.K.	10.9	5.8	5.1	8.9	5.5	3.4
Canada	9.9	9.0	0.9	9.8	8.9	0.9
U.S.	7.1	6.4	0.7	6.2	5.6	0.6
Japan	2.7	2.2	0.5	2.3	1.9	0.4
Australia	8.4	5.9	2.4	9.0	6.2	2.7
New Zealand	4.9	4.3	0.6	8.9	6.6	2.3
OECD	7.8	4.7	3.4	8.0	5.2	3.1
Europe	8.2	4.3	4.2	8.3	4.9	3.7
non-Europe	6.6	5.6	1.0	7.2	5.8	1.4

Source: Nickell (1997: Table 1).

Short-term unemployment, i.e. a duration of unemployment less than one year, also varied widely in OECD countries. Again in Switzerland in both periods the short-term unemployment rate was lowest. In contrast, Canada in 1983–89 and Spain in 1989–1994 reported the highest rate (about 9 per cent). The mean rate of short-term unemployment in OECD countries accounted for more than half of

the rate of total unemployment – with the non-European countries showing up a much higher share. The variation in short-term unemployment in Europe and non-Europe increased in the course of time but in both periods the rate was higher in the European countries.

With respect to long-term unemployment the empirical evidence reflects developments in total and short-term unemployment. Again Spain and Switzerland are among the countries with the extreme values. Long-term unemployment in non-European countries seems to have been a problem of only minor importance – 1.0 per cent and 1.4 per cent in 1983–1988 and 1989–1994 respectively – compared with Europe where this type of unemployment accounts for 4.2 per cent and 3.7 per cent.

3. Features of OECD Labour Markets

The theoretical framework to explain unemployment rates in OECD countries' labour markets is given by the familar model of Layard et al. (1991). The model is characterized by an upward sloping wage-setting schedule – which follows from the assumption that real wages are the result of a bargaining process between employers and employees – and a downward sloping labour demand schedule. Product market conditions and a number of wage push factors influence the labour demand schedule and the wage setting schedule respectively. The intersection of the labour demand schedule and the wage setting schedule determine the equilibrium of the structural unemployment rate and of real wages. Structural unemployment is thus a function of wage-push factors, price-push factors, and the elasticities of real wages and price mark-ups to unemployment (Elmeskov et al. 1998: 212–213).

The determinants of unemployment may be classified with respect to four categories: direct labour market rigidities, the treatment of the unemployed, the structure of wage determination and taxes.[3] The database for the 1989–1994 period is given in Table A1. Some descriptive statistics are presented in Table 2.

Table 2: Features of OECD Labour Markets (Descriptive Statistics), 1989–94

	OECD		Europe		non-Europe	
	Mean	STD	Mean	STD	Mean	STD
Direct Rigidities						
Employment Protection	10.5	5.9	12.8	4.8	3.6	2.7
Labour Standards	4	2.2	4.7	2.0	1.8	1.3
Treatment of the Unemployed						
Benefit Replacement Rate	56.7	17.4	59.9	17.7	47	13.5
Benefit Duration	2.3	1.4	2.4	1.3	2	1.8
Active Labour Market Policies	12.3	12.5	14.8	13.5	4.6	1.7
Structure of Wage Determination						
Union Density	40.3	19.8	43.0	21.5	32.4	11.8
Union Coverage	2.7	0.6	2.9	0.4	2	0.7
Union Coordination	2.0	0.7	2.1	0.7	1.6	0.5
Employer Coordination	2.0	0.9	2.3	0.8	1.2	0.4
Taxes						
Payroll Tax Rate	20.6	11.5	22.4	11.7	13.2	7.8
Total Tax Rate	48.2	11.8	51.8	11.0	37.3	6.2

Source: Nickell (1997: Tables 4 and 5). – Own calculations.

Direct labour market rigidities are present if employment legislation is stringent and labour market standards are strict. Employment legislation may be measured by the employment protection index. This index was constructed by the OECD and is based on the legal regulations with respect to hiring and firing. Countries are ranked from 0 to 20, with 20 indicating the most stringent restrictions. Southern European countries like Italy, Spain and Portugal are the most stictly regulated whereas the United States, New Zealand and Canada have the weakest laws.

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[3] Nickell (1997).

The labour standard index – also introduced by the OECD – measures the strictness of regulations with respect to several aspects of the labour market. The index is based on five characteristics: working time, fixed-term contracts, employment protection, minimum wages and employees representation rights (on work councils, company boards etc.). Each feature is being scored from 0 (no legislation) to 2 (strict legislation) and the scores are added up. Thus the index ranges from 0 to 10. The emerging picture is very much the same as in the case of the employment protection index. E.g., Italy and Spain rank very high whereas the United States and Canada rank lowest.

The treatment of the unemployed by social security systems is another labour market feature which seems to be helpful to explain why unemployment rates in OECD countries differ. Benefit systems show up a large variation. The replacement rate indicates the share of income replaced by unemployment benefits. The rate ranges from about 20 per cent for Italy to about 80 per cent for Sweden. Benefit duration also varies widely. Whereas the benefits in the United States, Japan and Italy are strictly time-limited (only six months), the benefit duration in several European countries like Belgium, Germany, Ireland and the U.K. as well as in Australia and New Zealand is up to 4 years. Active labour market policy which aims at reintegrating the unemployed into regular work (e.g. labour market training, assistance with job search, subsidized employment, measures for the disabled), also varies widely between OECD countries. If labour market policy is measured by the amount of active labour market spending per unemployed (as a percentage of GDP per person of the labour force) Sweden's figure of about 60 per cent ranks highest. Germany comes next with expenditures of nearly 26 per cent. The United States with only 3 per cent spend the least.

Other institutional features which seem to be important with respect to determine the variation in unemployment rates are the characteristics of the wage bargaining system.[4] Union density figures give the percentage share of union members in relation to total wage and salary earners. According to this measure Sweden and other Northern European countries rank highest. In contrast in France, Spain and the United States membership in unions is small. However these numbers may be somewhat misleading because in some countries – even in those with small shares like France and Spain – union wage negotiations nevertheless determine the wages of large parts of the workforce. To account for this circumstance a union coverage index has been calculated which shows the percentage share of workers actually covered by union wage bargaining (with 3 indicating more than 70 per cent covered, 2: 25–70 per cent and 1: less than 25 per cent covered). In all European countries except Switzerland and the United Kingdom more than 70 per cent of the workforce are covered by union wage bargaining.

The next two rows indicate the degree of coordination in wage bargaining which refer to the part of unions and employers respectively. For both measures the degree of coordination is ranked from 1 (low) to 3 (high). The coordination of the unions is highest in Northern Europe and Austria. In contrast, the non-European countries as well as Switzerland and the United Kingdom rank lowest. The ranking of coordination on the employer's side look very much the same.

The last two rows present information on the tax burden of labour. Payroll taxes which are defined as non-wage labour costs to wages vary widely. On the one extreme is Denmark, which levies nearly no payroll taxes at all. At the other extreme are Italy and France where payroll taxes account for about 40 per cent of

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[4] See Calmfors (1993).

wages. The total tax burden which is based on national income accounts shows less variation but nevertheless varies considerably. The figures range from 28.7 per cent for Australia to 70.7 per cent for Sweden. These data indicate the magnitude of the tax wedge in the labour market, i.e. measure the difference between real labour cost and real take-home pay and thus give a better impression of the real tax burden on labour.[5] The differences between Europe and non-Europe with respect to labour market rigidities seem to be rather great. This is especially true for the total tax rate which in 1989–1994 in OECD countries was 48.2 per cent but was 51.8 per cent in Europe compared with 37.3 per cent in non-Europe.[6] In the following analyses the impact of this last feature of the labour market in OECD countries as a determinant of unemployment performance is in the centre of attention.

4. Labour Market Rigidities and Total Unemployment

For evaluating the importance of taxes on unemployment records in OECD countries properly, the impact of other possible determinants has to be taken into account. In the following sections this will be done by multiple regression analyses.

As regards the relationship between labour market institutions and unemployment, a correlation matrix of the endogenous and exogenous variables has been calculated (Table A2). The correlations for the endogenous variables indicate that short-term und long-term unemployment are highly correlated. With respect to

[5] Nickell (1997: 62).

[6] If Switzerland – which may be regarded as an untypical European country in this respect – is excluded from the European sample the difference between Europe and non-Europe increases further.

the hypothesized determinants of unemployment the strong correlation between the degree of employer's coordination in the wage bargaining process and total (as well as short-term and long-term) unemployment is worth to mention. A low level of coordination seems to have contributed to a higher rate of unemployment. The duration of benefits also seems to have played a significant role in the determination of total and long-term unemployment. A long benefit duration was positively related with the rate of unemployment. Active labour market policies were also significantly correlated with unemployment. The higher the level of active labour market policies the lower was the total (as well as the short-term and long-term) unemployment rate. Direct rigidities of the labour market such as employment protection legislation and labour standards only had a significant positve impact on long-term unemployment. The simple correlation coefficients of the remaining possible determinants of unemployment turn out to be not significantly correlated with unemployment.[7] This is also true for the two tax variables (the ratio of payroll taxes and of total taxes) and unemployment.

The correlation matrix in addition presents evidence whether or not the labour market features are correlated among themselves. A high partial correlation between exogenous variables may serve as a first indication of possible problems of multicollinearity in the following regression analyses. As can be seen the two measures for direct rigidities on OECD labour markets, namely employment protection and labour standards, are highly correlated. The same is true for the relationship between these two measures and the two tax variables. Furthermore, labour standards are significantly correlated with measures of active labour market policies, unionization and union coordination and as well with wage coordination on the employer's side. From the measures for the treatment of the unem-

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[7] There may however be a significant impact on unemployment if the influence of other determinants is held constant.

ployed it seems worth to mention that active labour market policies are significantly correlated with nearly all other potential determinants of unemployment. Moreover the measures which refer to the organization of the wage bargaining process are all highly correlated among themselves. In addition the partial correlation between payroll taxes and total taxes is also highly significant.

To evaluate the impact of the hypothesized determinants on unemployment, multiple regression analyses of the underlying reduced-form equation of the labour market have been carried out. Based on these analyses it is possible to measure the influence of a potential determinant on unemployment when the impact of other determinants is held constant. The regression analyses follow Nickell (1997: 64) with some exceptions. As in Nickell, total, long-term and short-term unemployment are investigated. The regressions are based on a combined cross-section analysis for the OECD countries in 1983–1988 and 1989–1994. From the potential determinants of unemployment, direct rigidities were left out of the analyses. The reason is that employment protection did not – at conventional significance levels – exert a significant influence on unemployment. The impact of labour standard legislation was not significant either.[8] As in Nickell (1997) all three variables which refer to the treatment of the unemployed (benefit replacement rate, benefit duration and active labour market policies) will serve as exogenous variables. The variables which describe the institutional wage bargaining process are all highly correlated (Table A2). To avoid possible problems of multicollinearity only two of these variables enter the regression analyses. Finally, only the impact of total taxes will be investigated. The reason is that

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[8] In the course of this analysis the variable labour standards instead will serve as an instrument in further testing.

the total tax rate – compared with payroll taxes – is a better indicator of the real tax wedge in OECD countries (Nickell 1997: 68–69).

The regression results for total unemployment are presented in Table 3 (Column 1). All of the investigated determinants are highly significant at the 1 per cent level and show the expected signs. Generous benefit systems seem to raise the rate of total unemployment. A high benefit replacement ratio seems to lead to an upward pressure on wages from employees. In addition a high benefit replacement ratio allows the unemployed to be more choosy. For the same reasons a long duration of entitlement also contributes to a higher total unemployment rate. Active labour market policies through its active measures to bring unemployed persons back to work have succeeded in reducing the unemployment rate.[9] The features of the wage bargaining process also had an impact on unemployment. A high union density seems to push up unemployment rates. In contrast, highly coordinated wage bargaining on the employer's side (and perhaps as well on the side of the unions – given the highly significant partial correlation between employer's coordination and union's coordination (Table A2)) strongly contributes to lower rates of total unemployment. Finally high tax wedges lead to a rise in the rates of total unemployment. Thus all the regression coefficients show the expected signs and are statistically significant even at the 1 per cent level. The determinants of this approach "explain" about two thirds of the variation in OECD unemployment rates in 1988–1994.

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[9] Because of possible "reverse causation" this variable has been instrumented (Nickell 1997: Table 6).

Table 3: Regressions to Explain Log Total Unemployment Percentage Rate (20 OECD countries, 1983–88 and 1989–94)

Equation[a]	(1) OLS	(2) OLS	(3) OLS	(4) TSLS
Endogenous Variable[b]	UNEMP	TAX	UNEMP	UNEMP
Exogenous Variables[c]				
C	0.416	29.613	–0.341	–0.341
	(1.14)	(4.72**)	(–0.66)	(–0.56)
RRATE	0.013	0.006	0.015	0.015
	(3.12**)	(0.06)	(3.56**)	(3.01**)
BENEFIT	0.121	–0.022	0.100	0.100
	(2.81**)	(–0.023)	(2.33*)	(1.98+)
ALMP	–0.025	0.211	–0.035	–0.035
	(–3.44**)	(1.29)	(–4.08**)	(–3.46**)
UDEN	0.014	–0.047	0.017	0.017
	(3.29**)	(–0.49)	(3.91**)	(3.31**)
EMCORD	–0.724	3.171	–0.847	–0.847
	(–6.82**)	(1.36)	(–7.11**)	(–6.02**)
TAX	0.031	·	0.051	0.051
	(4.56**)		(4.22**)	(3.57**)
DUM90	0.233	0.581	0.231	0.231
	(1.94+)	(0.22)	(2.00+)	(1.69+)
LSTAND	·	2.692	·	·
		(3.59**)		
RES	·	·	–0.028	·
			(–1.98+)	
$\bar{R}^2$	0.67	0.46	0.70	0.58
S.E. Regression	0.37	8.31	0.36	0.42
N (countries, time)	20; 2	20; 2	20; 2	20; 2
F-Test	12.36**	5.82**	12.29**	(9.17**)
(p-value)	(0.00)	(0.00)	(0.00)	(0.00)
Jarque-Bera-Test	0.62	2.34	0.95	0.48
(p-value)	(0.74)	(0.31)	(0.62)	(0.79)
White-Test	0.62	0.72	0.77	0.82
(p-value)	(0.82)	(0.75)	(0.70)	(0.68)

[a] Estimation using two time periods (1983–88 and 1989–94). t-test statistics in parentheses. + significant at 10 per cent, * at 5 per cent and ** at 1 per cent. OLS, ordinary least squares. TSLS, two stage least squares. – [b] UNEMP, log of total unemployment percentage rate. TAX, total tax share. – [c] RRATE, replacement rate. BENEFIT, benefit duration. ALMP, active labour market policies. UDEN, union density. EMCORD, employer's coordination. DUM90, dummy variable (1989–94 = 1). LSTAND, labour standards. RES, residual.

Source: Tables 1 and A1; Nickell (1997). – Own calculations.

5.   Are Taxes Exogenous?

Against this approach one might object that problems of "reverse causation" may jeopardize these results. Above all one can suppose that a rising unemployment rate also implies higher unemployment benefits payments and more expenditures on active labour market policies. Thus a higher unemployment rate may also lead to a higher tax rate. If taxation is in fact an endogenous variable which is simultaneously determined, this simultaneity can cause ordinary least-squares parameter estimates to be biased and inconsistent.[10] If so, an alternative estimation method must be used.

To test whether the tax variable is really exogenous or is simultaneously determined with the total unemployment rate one can run a Hausman specification test by an auxilary regression. In this regression the total tax rate is regressed on the above hypothesized exogenous variables (the constant, the replacement rate, benefit duration, active labour market policies, union densities, the employer's coordination, the "dummy" variable for 1989–1994) and an instrumental variable. As an instrumental variable we chose the index of labour standards (LSTAND) which is highly correlated with the total tax rate (Table A2). The results of this regression are given in Table 3 (Column 2). The residuals from this regression are saved in a variable called RES.

The next step is to reestimate the unemployment equation (Column 1) including the residuals from the auxiliar regression. The results are presented in Column 3. Under the null hypothesis that taxes are exogenous the variable RES in this second stage regression should not be significantly different from zero. As can be seen, the t-statistics indicate that the coefficient is only significant at the 10 per

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[10] Pindyck and Rubinfeld (1998: 353–355).

cent level. Thus, at the conventional 5 per cent significance level the null hypothesis for this variable cannot be rejected. Total taxes with respect to the total unemployment rate in fact may be assumed to be exogenous. A simultaneity problem seems not to be present.

If instead – to illustrate the alternative estimation procedure – a significance level of 10 per cent is assumed to be sufficient the null hypothesis has to be rejected. Under this assumption ordinary least squares estimates of the total unemployment equation (Column 1) must be considered as biased and inconsistent. To receive unbiased and consistent estimates two-stage least squares estimation technique can be employed. In such an estimation the hypothesized exogenous variables (C, RRATE, BENEFIT, ALMP, UDEN, EMCORD, DUM90) and the instrumental variable LSTAND serve as instruments. The results of the two-stage least squares estimation are shown in Column 4. The estimated coefficients are the same as in Column 3 but the standard errors and t-statistics are now estimated correctly. Compared with Column 1 the coefficients and the significance levels have changed but slightly. The coefficient of the benefit duration now is significant only at the 10 per cent level. The coefficient of the tax variable under the assumption of simultaneity has increased slightly. The equation "explains" about 60 per cent of the variation in OECD total unemployment in 1983–1994.

6.   The Impact of Taxation on Short-term and Long-term Unemployment

Whether taxes are exogenous or endogenous seems to depend on the underlying significance level. But if the conventional level of 5 per cent is applied the total tax rate must be considered as exogenous with respect to the total unemployment rate. Thus the original estimation (Column 1) seems to be unbiased and consistent. However, with respect to short-term and long-term unemployment rates

things could be different. One might hypothesize that in particular in the case of long-term unemployment a simultaneity problem exists. The reason is that long-term unemployment seems to be accompanied by higher government expenditures for the unemployed which in turn might lead to a higher total tax rate. Thus the relation between taxation and long-term unemployment could even be mutually reinforcing.

The respective empirical tests are first applied to short-term unemployment (Table 4). Column 1 presents the basic ordinary least squares estimates. The replacement rate, active labour market policies, union density, employer's coordination and the total tax share exert a significant impact on the short-term unemployment rate. These features of the labour market (significantly) "explain" 57 per cent of short-term unemployment in OECD countries. The Jarque-Bera-test and the White-test indicate that the residuals are normally distributed and homoscedastic.

The Hausman specification test to examine whether taxation is exogenous with respect to short-term unemployment again consists of an auxiliary regression (Column 2). The total tax rate is regressed on all the exogenous variables of the original ordinary least squares regression and an instrumental variable (LSTAND). The residuals from this regression are again stored in a variable called RES. In the second step this variable is added to the original equation.

The estimates are presented in Column 3. As can be seen, the variable RES turns out to be insignificant. Thus the null hypothesis that total taxes are exogenous with respect to short-term unemployment cannot be rejected. The ordinary least squares estimates (Column 1) thus seem to be consistent and unbiased.

Table 4: Regressions to Explain Log Short-Term Unemployment Percentage Rate (19 OECD countries, 1983–88 and 1989–94)

Equation[a]	(1) OLS	(2) OLS	(3) OLS
Endogenous Variable[b]	SUNEMP	TAX	SUNEMP
Exogenous Variables[c]			
C	0.216	29.634	0.260
	(0.61)	(4.57**)	(0.49)
RRATE	0.016	0.007	0.016
	(3.73**)	(0.073)	(3.59**)
BENEFIT	0.050	–0.055	0.051
	(1.18)	(–0.05)	(1.15)
ALMP	–0.019	0.211	–0.018
	(–2.70*)	(1.25)	(–2.14*)
UDEN	0.014	–0.046	0.014
	(3.44**)	(–0.47)	(3.13**)
EMCORD	–0.671	3.092	–0.664
	(–6.14**)	(1.19)	(–5.18**)
TAX	0.022	.	0.021
	(3.44**)		(1.71[+])
DUM90	0.226	0.671	0.227
	(1.92[+])	(0.24)	(1.89[+])
LSTAND	.	2.698	.
		(3.48**)	
RES	.	.	0.002
			(0.12)
$\bar{R}^2$	0.57	0.45	0.56
S.E. Regression	0.36	8.58	0.36
N (countries, time)	19; 2	19; 2	19; 2
F-Test	8.04**	5.30**	6.80**
(p-value)	(0.00)	(0.00)	(0.00)
Jarque-Bera-Test	1.17	2.53	1.23
(p-value)	(0.56)	(0.28)	(0.54)
White-Test	2.07	0.93	0.65
(p-value)	(0.30)	(0.63)	(0.80)

[a] Estimation using two time periods (1983–88 and 1989–94). t-test statistics in parentheses. [+] significant at 10 per cent, * at 5 per cent and ** at 1 per cent. OLS, ordinary least squares. – [b] SUNEMP, log of short-term unemployment percentage rate. TAX, total tax share. – [c] RRATE, replacement rate. BENEFIT, benefit duration. ALMP, active labour market policies. UDEN, union density. EMCORD, employer's coordination. DUM90, dummy variable (1989–94 = 1). LSTAND, labour standards. RES, residual.

Source: Tables 1 and A1; Nickell (1997). – Own calculations.

The respective tests for long-term unemployment are shown in Table 5. In the basic ordinary least squares equation benefit duration, active labour market poli-

cies, employer's coordination and the total tax rate all turn out to be significant parameters of long-term unemployment. The residuals from an auxiliary regression (Column 2) turn out to be significant at the 5 per cent significance level (Column 3). Thus the null hypothesis that the total tax rate with respect to long-term unemployment is exogenous has to be rejected. Long-term unemployment and the total tax rate seem to be simultaneously determined. The equation in Column 3 gives the adjusted coefficients for the exogenous variables. However the standard errors from this ordinary least squares regression are not correct. To obtain correct standard errors (and t-statistics) a two-stage least squares regression was run (Column 4). In this equation the same variables as in the original equation (Column 1) turn out to be statistically significant. But the values of the coefficients have changed.[11] While the coefficient of benefit duration has decreased, the coefficients of the other variables have increased. The parameter of the total tax rate turns out to be more than twice as high – at a higher level of significance – as in the original ordinary least squares estimation. Thus, the impact of taxation on long-term unemployment turns out to be much larger than in the first estimate.

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[11] The adjusted coefficient of determination is also much lower but still significant at the 1 per cent level. One reason for the decrease seems to be that two-stage least squares estimation uses up a larger number of degrees of freedom.

Table 5: Regressions to Explain Log Long-Term Unemployment Percentage Rate (19 OECD countries, 1983–88 and 1989–94)

Equation[a]	(1) OLS	(2) OLS	(3) OLS	(4) TSLS
Endogenous Variable[b]	LUNEMP	TAX	LUNEMP	LUNEMP[c]
Exogenous Variables[d]				
C	–1.464	29.63	–3.710	–3.710
	(–1.70[+])	(4.57**)	(–3.19**)	(–2.40*)
RRATE	0.005	0.007	0.009	0.009
	(0.49)	(0.07)	(0.99)	(0.74)
BENEFIT	0.360	–0.055	0.296	0.296
	(3.50**)	(–0.053)	(3.04**)	(2.29*)
ALMP	–0.040	0.211	–0.067	–0.067
	(–2.30*)	(1.25)	(–3.54**)	(–2.67*)
UDEN	0.010	–0.046	0.019	0.019
	(0.98)	(–0.468)	(1.92[+])	(1.45)
EMCORD	–0.609	3.092	–0.977	–0.977
	(–2.27*)	(1.19)	(–3.46**)	(–2.61*)
TAX	0.043	.	0.102	0.102
	(2.71*)		(3.80**)	(2.86**)
DUM90	0.291	0.671	0.282	0.282
	(1.01)	(0.24)	(1.07)	(0.80)
LSTAND	.	2.699	.	.
		(3.48**)		
RES	.	.	–0.084	.
			(–2.62*)	
$\bar{R}^2$	0.46	0.45	0.55	0.20
S.E. Regression	0.88	8.58	0.80	1.07
N (countries, time)	19; 2	19; 2	19; 2	19; 2
F-Test	5.46**	5.30**	6.56**	4.16**
(p-value)	(0.00)	(0.00)	(0.00)	(0.00)
Jarque-Bera-Test	0.08	2.53	1.37	0.31
(p-value)	(0.96)	(0.28)	(0.50)	(0.86)
White-Test	0.76	0.93	1.20	2.28
(p-value)	(0.72)	(0.63)	(0.34)	(0.27)

[a] Estimation using two time periods (1983–88 and 1989–94). t-test statistics in parentheses. [+] significant at 10 per cent, * at 5 per cent and ** at 1 per cent. OLS, ordinary least squares. TSLS, two stage least squares. – [b] LUNEMP, log of long-term unemployment percentage rate. TAX, total tax share. – [c] RRATE, replacement rate. BENEFIT, benefit duration. ALMP, active labour market policies. UDEN, union density. EMCORD, employer's coordination. DUM90, dummy variable (1989–94 = 1). LSTAND, labour standards. RES, residual.

Source: Tables 1 and A1; Nickell (1997). – Own calculations.

7.   The Relative Importance of Taxation

As the variables in the foregoing regressions are defined in different units with different variances, the estimated coefficients do not tell anything about the relative importance of the different features of OECD labour markets on unemployment. One method to get such informations is to calculate standardized regression coefficients ("beta coefficients"). The standardized regression coefficient adjusts the estimated slope parameter by the ratio of the standard deviation of the independent variable to the standard deviation of the dependent vatiable. E.g. a standardized coefficient of 0.6 means that a change of one standard deviation of this independent variable leads to a change of 0.6 standard deviation in the dependent variable.

The standardized regression coefficients of the correctly specified regressions with respect to total, short-term and long-term unemployment are presented in Table 6. The calculations for total unemployment reveal that the independent variable with the greatest relative importance is employer's coordination in the wage bargaining process. The standardized coefficient for this variable implies that an index of this variable which is one standard deviation above the mean (e.g. is 2.9 instead of 2.0) is related to a 1.12 standard deviation lower total unemployment rate (i.e. a rate of total unemployment which is about 2.1 percentage points lower than the mean total unempoyment rate of 7.9 per cent). The relative importance of the total tax rate ranks second. The standardized regression coefficient is 0.88. Thus, a total tax rate of e.g. 60 per cent instead of 48.2 per cent implies that total unemployment is 0.88 standard deviation of the log of the total unemployment rate. This would lead to a total rate of unemployment which would be higher by 1.8 percentage points. The ranking of the other variables is: active labour market policies, union density and the replacement rate. The rank

of benefit duration (which is significant only at the 10 per cent level) is the lowest.

Table 6:   Standardized Regression Coefficients[a]

Endogenous Variable[b]	UNEMP	SUNEMP	LUNEMP
Exogenous Variables[c]			
RRATE	0.409**	0.534**	0.148
BENEFIT	0.225[+]	0.135	0.371*
ALMP	–0.624**	–0.419*	–0.681*
UDEN	0.492**	0.496**	0.304
EMCORD	–1.120**	–1.042**	–0.697*
TAX	0.882**	0.467**	0.992**
DUM90	0.179[+]	0.210[+]	0.120

[a] "Beta-coefficients". – [b] UNEMP, SUNEMP and LUNEMP, log of total, short-term and long-term unemployment percentage rate respectively. – [c] RRATE, replacement rate. BENEFIT, benefit duration. ALMP, active labour market policies. UDEN, union density. EMCORD, employer's coordination. TAX, total tax share. DUM90, dummy variable (1989–94 = 1).

Source: Tables 3, 4 and 5. – Own calculations.

The respective calculations for short-term unemployment indicate a slightly different ranking. In this case, a total tax rate of one standard deviation above the mean implies a 1.4 percentage points higher rate of short-term unemployment.

Finally from the calculations for long-term unemployment it can be seen that the total tax rate is the variable with the greatest relative importance. The standardized regression coefficient of about 1 implies that a total tax rate of one standard deviation above the mean is related to a rate of long-term unemployment which is – the other variables held constant – about 3.25 percentage points higher.[12]

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[12] In a quite different approach than the one persued here – namely an unemployment-growth model – Daveri and Tabellini (1997) estimated that the rise of 9.4 percentage points in effective labour market taxes between 1965–1975 and 1976–1991 in Europe can account for a rise in the unemployment rate of about 4 percentage points.

8. Conclusions

The aim of this paper was to assess the impact of taxation on unemployment. To estimate this relation properly it was necessary to also take account of other possible determinants of unemployment. In the estimations – holding the other determinants (i.e. the replacement rate, benefit duration, active labour market policies, union density and employer's coordination in wage bargaining) constant – the total tax rate turned out to be a significant and important determinant of the total, short-term and long-term unemployment rate.

Because one might assume that a higher unemployment rate could also lead to higher taxation in the economy – because of rising government expenditures – it was also investigated whether the impact of taxation on unemployment is really exogenous or whether it is endogenous (i.e. simultaneously determined). The empirical tests turned out to be negative for total and short-term unemployment but positive for long-term unemployment. The correction of this "simultaneity bias" with the help of an instrumental variables approach and two-stage least squares estimation techniques revealed a slope parameter of the total tax rate which was much higher than the one originally received from ordinary least squares estimation. The reason seems to be that the relationship between taxation and long-term unemployment is a mutually reinforcing one: A rising total tax rate leads to higher long-term unemployment rate (and government expenditures) which in turn lead to a higher tax rate.

Additional calculations revealed that a reduction in the total tax rate of about one standard deviation (11.5 percentage points) – a magnitude which is smaller than the difference between the total tax rate in Europe and non-Europe[13] – leads to

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[13] See Table 2.

reduction of long-term unemployment in the order of 3.2 percentage points. This magnitude is within the range of the difference of the long-term unemployment rate between Europe and non-Europe.

Table A1: Features of OECD Labour Markets, 1989–94

	Direct Rigidities		Treatment of the Unemployed		
	Employment Protection	Labour Standards	Benefit Replacement Rate (p.c.)	Benefit Duration (years)	Active Labour Market Policies
Austria	16	5	50	2	8.3
Belgium	17	4	60	4	14.6
Denmark	5	2	90	2.5	10.3
Finland	10	5	63	2	16.4
France	14	6	57	3	8.8
Germany (W)	15	6	63	4	25.7
Ireland	12	4	37	4	9.1
Italy	20	7	20	0.5	10.3
Netherlands	9	5	70	2	6.9
Norway	11	5	65	1.5	14.7
Portugal	18	4	65	0.8	18.8
Spain	19	7	70	3.5	4.7
Sweden	13	7	80	1.2	59.3
Switzerland	6	3	70	1	8.2
U.K.	7	0	38	4	6.4
Canada	3	2	59	1	5.9
U.S.	1	0	50	0.5	3.0
Japan	8	1	60	0.5	4.3
Australia	4	3	36	4	3.2
New Zealand	2	3	30	4	6.8

			Coordination			
	Union Density (p.c.)	Union Coverage Index	Union	Employer	Payroll Tax Rate (p.c.)	Total Tax Rate (p.c.)
Austria	46.2	3	3	3	22.6	53.7
Belgium	51.2	3	2	2	21.5	49.8
Denmark	71.4	3	3	3	0.6	46.3
Finland	72.0	3	2	3	25.5	65.9
France	9.8	3	2	2	38.8	63.8
Germany (W)	32.9	3	2	3	23.0	53.0
Ireland	49.7	3	1	1	7.1	34.3
Italy	38.8	3	2	2	40.2	62.9
Netherlands	25.5	3	2	2	27.5	56.5
Norway	56.0	3	3	3	17.5	48.6
Portugal	31.8	3	2	2	14.5	37.6
Spain	11.0	3	2	1	33.2	54.2
Sweden	82.5	3	3	3	37.8	70.7
Switzerland	26.6	2	1	3	14.5	38.6
U.K.	39.1	2	1	1	13.8	40.8
Canada	35.8	2	1	1	13.0	42.7
U.S.	15.6	1	1	1	20.9	43.8
Japan	25.4	2	2	2	16.5	36.3
Australia	40.4	3	2	1	2.5	28.7
New Zealand	44.8	2	1	1	—	34.8

Source: Nickell (1997: Tables 4 and 5).

Table A2: Correlation Matrix of Endogenous and Exogenous Variables, 1983–94

Variables[a]	UNEMP	SUNEMP	LUNEMP	EMPRO	LSTAND	RRATE	BENEFIT	ALMP	UDEN	UNION	UNCORD	EMCORD	PRTAX	TAX
UNEMP	.	.	.											
SUNEMP	.87**	.	.											
LUNEMP	.87**	.54**	.											
EMPRO	0.18	–0.24	0.53**	.	.									
LSTAND	0.14	–0.10	0.32*	0.77**	.									
RRATE	–0.06	0.05	–0.15	–0.11	0.09	.	.	.						
BENEFIT	0.48**	0.26	0.58**	0.17	0.16	0.01	.	.						
ALMP	–0.35*	–0.32*	–0.31*	0.19	0.41**	0.34*	–0.14	.						
UDEN	–0.17	–0.06	–0.17	0.02	0.13	0.23	0.06	0.57**	.					
UNION	0.26	–0.01	0.45**	0.64**	0.69**	0.08	0.50**	0.23	0.42**	.				
UNCORD	–0.27	–0.19	–0.16	0.35*	0.50**	0.41**	0.06	0.39**	0.56**	0.58**	.			
EMCORD	–0.58**	–0.47**	–0.45**	0.16	0.33*	0.57**	–0.09	0.50**	0.47**	0.40**	0.63**	.		
PRTAX	0.00	–0.13	0.13	0.57**	0.68**	–0.07	–0.09	0.33*	–0.21	0.18	0.21	0.12	.	.
TAX	–0.04	–0.01	–0.01	0.42**	0.67**	0.21	0.06	0.51**	0.24	0.38*	0.50**	0.45**	0.82**	.

[a] UNEMP, SUNEMP and LUNEMP, log of total, short-term and long-term unemployment percentage rate respectively. EMPRO, employment protection. LSTAND, labour standards. RRATE, replacement rate. BENEFIT, benefit duration. ALMP, active labour market policies. UDEN, union density. UNION, union coverage index. UNCORD, union coordination. EMCORD, employer's coordination. PRTAX, payroll taxes. TAX, total tax share.

Source: Nickell (1997). – Own calculations.

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