Labor market institutions and wage setting.
Empirical evidence for OECD countries

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Abstract

One of the main channels through which labour market institutions are supposed to work in determining macroeconomic performance, and the unemployment rate in particular, is trough their effects on the key parameters of the wage curve, particularly the responsiveness of the real wage to the unemployment rate. The question this paper addresses is whether empirical evidence for OECD countries tends to support this particular transmission mechanism. The analysis involves two steps. First, the methodology suggested by Pesaran, Shin and Smith (2001) is applied to time series data for each of 20 OECD countries over the period 1960-1999, in order to test for the existence of a long run level relationship between the real wage and the set of explanatory variables indicated by the theory, and to estimate the parameters of such long run wage curve for each country. Second, the relationship between the estimated wage elasticities to unemployment and a set of labour market institutions of regulatory nature which are supposed to influence such parameter (in particular benefit replacement rates and benefit duration, bargaining coordination, union density and employment protection) is investigated in a cross-country framework. Overall, the analysis finds little support for the role of labor market institutions in explaining inter-country differences in the responsiveness of the real wage to unemployment. None of the institutional variables considered has any significant effect whatsoever on the estimated responses of the real wage to unemployment when considering the whole cross-section sample of 20 OECD countries. When restricting the attention to smaller groups of countries, there is some evidence that benefit duration tends to lower the unemployment elasticity of the real wage, and that bargaining coordination and employment protection do have some significant effects, which are, however the opposite of what one would normally expect: real wages are more responsive to unemployment in countries with a lower degree of bargaining coordination and an higher degree of employment protection.

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1. Introduction

Labor market institutions are widely held to play an important role in the determination of unemployment trends. The story which the bulk of the literature on the subject tells, and which has become conventional wisdom, is that labor market institutions[2], by themselves or in combination with macroeconomic shocks are the main causes of persisting high unemployment[3], and account for most of the differences in unemployment patterns across OECD countries. A corollary of the story is, of course, that "good" institutional reforms must lie at the hearth of any success in reducing unemployment.

A list of influential papers which, in the last decade, have taken this point of view in the empirical analysis of unemployment in OECD countries includes Addison and Grosso (1996), Nickell (1997), OECD (1999), Siebert (1997), Scarpetta (1996, 1998), Blanchard and Portugal (1998), Elmeskov et al. (1998), Nickell and Layard (1999), OECD (1999), Blanchard and Wolfers (2000), Daveri and Tabellini (2000), Bertola et al, (2001), Nickell et al. (2001), Baker et al. (2002), Chen et al. (2002), IMF(2003), Belot and Van Ours (2004).

But why should institution matter in the determination of unemployment? The underlying theoretical idea is that labor market institutions matter because they introduce wage rigidities which in turn affect both the "equilibrium" unemployment rate and the ability of the economic system to adjust to its equilibrium levels after being hit by exogenous macroeconomic shocks, and thus the persistence of the unemployment effects of such shocks. Translated in modelling terms, institutions matter because they affect the parameters of the wage setting and price setting functions, most importantly the unemployment coefficient in the wage curve.

The interpretation of the sensitivity of the real wage to unemployment as an institutional parameter was central in the early contributions to the "institutional" analysis of unemployment, such as Bruno and Sachs (1985), Bean et alii (1986), Newell and Symons (1985, 1987), Alogoskoufis and Manning (1988), Layard et alii (1991). In these contributions, the empirical effort was precisely devoted at ascertaining the existence of linkages between institutional structures and the unemployment coefficients in the wage setting and/or price setting curves.

Contrary to this approach, the previously cited recent literature has concentrated on reduced forms, often totally disjoined from a theoretical model, in which unemployment is directly related to institutional variables. This approach is quite unsatisfactory, since it tends to obscure the importance of the very transmission mechanism from institutions to unemployment, namely the link

[2] Although several institutions of different kinds are potentially relevant in the discussion on unemployment, the literature has typically concentrated on some institutions with a "regulatory" caracter: unions (union density, bargaining coordination or concentation), systems of unemployment benefits (benefit replacement rates, benefit duration), employment protection regimes.

[3] "the causes of high unemployment can be found in labor market institutions" (IMF (2003), p. 129.

between institutions and wages, particularly between institutions and the wage responsiveness to unemployment. As Bean (1994) has underlined "such an approach cannot tell us anything about the slope of the real wage-unemployment relationship and much work has focused on intercountry differences in this parameter as a key source of the heterogeneity in unemployment experience" (Bean (1994), p. 583) [4].

This paper wants to re-set the focus on this core issue, by addressing the question of whether empirical evidence for OECD countries supports the theoretical predictions about the relationships between labour market institutions and the key parameters of the wage setting curves, most importantly the sensitivity of the real wage to unemployment. In order to do so the analysis proceeds in two steps. In the first step time series data over the period 1960-1999 are used to test for the existence of a long run level relationship between the real wage and a set of five canonical explanatory variables included in the wage curve (unemployment, productivity, the tax wedge, union density and the replacement rate), and to estimate the parameters of such long run equilibrium relation for each of 20 OECD countries, particularly the key parameter represented by the sensitivity of the real wage to unemployment. In the second step cross country data are used to investigate the extent to which inter-country differences in the estimated elasticities of the real wage to unemployment can be explained by inter-country differences in those labour market institutions which in theory should affect such key parameter, either because they reduce the disutility of job loss (like benefit replacement rates and benefit duration) or because they ease the exercise of insider power (like union density, or employment protection), or also because they induce wage setters to internalize the aggregate consequences of their actions (like bargaining centralization/coordination).

The results for the whole group of 20 OECD countries reveal that none of the institutional variables has any significant effect whatsoever on the estimated responses of the real wage to unemployment. When restricting the attention to smaller groups of countries, there is some evidence that benefit duration tends to lower the unemployment elasticity to the real wage, and that bargaining coordination and employment protection do have some significant effects. These are, however, the opposite of what one would normally expect, since real wages appear to be more responsive to unemployment in countries with a lower degree of bargaining coordination and an higher degree of employment protection. The upshot is that the evidence we find in favour of the main transmission mechanism from labour market institutions to unemployment is very weak at best.

The rest of the paper is organized as follows. Section 2 presents the theoretical model of wage setting which will be the reference point for the estimations of each country's wage equation.

[4] Another obvious point of weekness of such an approach, often overlooked by the literature, is the problem of endogeneity of institutions, and of reverse causality from unemployment to institutional settings. But even leaving aside these problems, the results of the empirical literature on the subject are not robust, and often do not support the predictions of the theory (on this point see, for example Baker et al. (2002) and, more recently, Zenezini (2004))

Section 3 concentrates on the time series estimations of the individual wage setting curves. Subsection 3.1 presents the methodology adopted, following Pesaran, Shin and Smith (2001), in order to test the existence and to estimate the parameters of the long run level relationship between the real wage and the set of explanatory variables suggested by the theory. Subsection 3.2 presents the resulting estimates. Section 4 investigates on the relationships between labour market institutions and the estimated key wage setting parameters in a cross-country framework. Section 5 concludes.

2. The wage equation: a background theoretical model

As a theoretical reference point for the wage equation that will be estimated for each country, consider a simple bargaining model, of the kind originally introduced by Nickell and Andrews (1983), reviewed in Layard and al. (1991)[5], and used, for example, in Darby and Wren-Lewis (1993).

Consider a Nash bargaining framework in which many identical unions and firms effectively set real wages according to:

1. $w = argmax[(V - V')^{\eta} (\pi - \pi')]$,

where V is the union's objective function, π are the firm's (real) profits and V' and π' are their relative "fallback" levels, i.e. the values that V and π would take if the parties failed to reach a settlement and there were a strike or lockout. The parameter η represents the union's relative bargaining strenght.

Suppose the union's objective is simply given by the real wage (w), net of income taxes (t_y):

2. $V = w(1- t_y)$

Assume that fallback income for unionized workers is either the real wage they may earn getting employed elsewere during the strike (lockout), w', or the real state benefits, *B*, they receive in case they become unemployed, so that if the probability of becoming unemployed is a (positive) function, f, of the aggregate unemployment rate, u, fall-back income may be expressed as[6]:

3. $V' = (1-f(u))\, w'(1- t_y) + f(u)\, B$

If labour (L) and physical capital (K) are the only two inputs in production, and letting ν represent the real cost of physical capital, the expression for real profits is:

4. $\pi = Y - w(1+t_e) L - \nu K$

where t_e represent non-wage costs of labor, and in particular employment taxes .

Assume, finally, that in case of strike or lockout, fallback profits will be be zero, i.e. $\pi'=0$.

In such a setting the bargained real wage must satisfy:

[5] Chapter 2.

[6] Benefits are supposed to be untaxed.

5. $\pi/L = \eta^{-1}\,[(1+t_e)/\,(1-t_Y)]\,(V - V')$

Assuming that the inside and outside wage are equal (w'=w), then:

6. $V - V' = w\, f(u)\, [(1-t_y) - B/w]$

Substituting expressions 6. and 4. into 5. one gets the following expression for the real wage:

7. $w = (1+t_e)^{-1}\,(Y/L - \nu K)\,[1 + \eta^{-1}\, f(u)\,(1 - BRR(1-t_Y)^{-1}]^{-1}$

where BRR = B/w is the replacement ratio.

If the production function is Cobb-Douglas, with exponents of labor and capital inputs equal to α and β respectively, then $\nu K = (1+t_e)\, w\, \beta/\alpha$, and the expression for the real wage simplifies to:

8. $w = (1+t_e)^{-1}\,(Y/L)\,[1 + \beta/\alpha + \eta^{-1}\, f(u)\,(1 - BRR(1-t_Y)^{-1})]^{-1}$

Equation 8. represents our theoretical wage equation. It suggests that the real wage is related to six fundamental variables: productivity, the unemployment rate, the replacement ratio, union bargaining strenght, plus employment and income taxes.

3. Estimating the wage setting parameters

Notice that the "core" wage equation presented above concentrates on long run behaviour. It points out the existence of a long run level relationship between the real wage and the indicated set regressors, abstracting from the short-run dynamic behavior of real wage adjustments.

In the majority of applied time series work, cointegration techniques are adopted in order to test for the existence of long run level relationships between variables. Cointegration techniques, however, require the relevant variables to be individually integrated of order 1, and such a prerequisite appears to be rather stringent for the variables which are typically involved in a wage equation (such as our equation 8). In particular if one thinks of the very nature of variables like the replacement ratio, the degree of unionization of workers, tax wedges and the like, considerable doubts arise regarding their order of integration.

For this reason, the alternative methodology proposed by Pesaran, Shin and Smith (2001) will be applied, which allows to test the existence of a level relationship between a dependent variable and a set of regressors regardless of whether they trend stationary, first-difference stationary or mutually cointegrated.

3.1 The methodology

Following Pesaran, Shin and Smith (2001), let's start with the assumption that the time series properties of the variables in our "core" wage equation may be reasonably approximated by a log-linear VAR(m) model, extended to include interceps and trend terms:

9. $\mathbf{A}(L)\,(\mathbf{z}_t - h - gt) = e_t \quad t=1, 2, ...$

L is the lag operator, h and g are 7x1 vectors of constant and trend coefficients, $\mathbf{A}$ is a 7x7 matrix lag polinomial, and $\mathbf{z}_t$ the 7x1 vector of endogenous variables, which includes the real wage and the set of the other six variables included in equation 8., i.e. productivity, the unemployment rate, the net replacement rate, some measure of union bargaining strenght and labor and income taxes. All variables are expressed in logs. In symbols:

10. $\mathbf{z_t} = (w_t , \mathbf{x_t}')'$

where $w_t = \log(w_t)$ and $\mathbf{x_t}' = (\log (Y_t/L_t), \log (u_t), \log(BRRn_t), \log(\eta_t), \log(t_{et}), \log(t_{yt}))'$.

All the variables in $\mathbf{z_t}$ are allowed to be either purely I(0), purely I(1) or cointegrated, but they cannot be explosive unit roots or seasonal unit roots.

The errors in the vector $e_t = (\varepsilon_w, e_x')'$ are assumed to be independent and identically distributed with zero mean and a positive definite variance-covariance matrix: $W = [w_{ww}\, w_{w\mathbf{x}}, w_{\mathbf{x}w}\, W_{\mathbf{xx}}]$

The VAR(m) model in 10. can be rewritten in vector ECM form as:

11. $\Delta \mathbf{z_t} = \mathbf{b}_0 + \mathbf{b}_1 t + \mathbf{P}\ \mathbf{z}_{t-1} + \Sigma_i \mathbf{G}_i\ \Delta\ \mathbf{z}_{t-i} + e_t$ $\qquad t = 1, 2, ...; i = 1, ..m-1$

where Δ is the difference operator, and where the matrixes $\mathbf{P}$ and $\mathbf{G_i}$ may be partitioned according to the partition of $\mathbf{z}$: $\mathbf{P} = (\mathbf{P}_w\ \mathbf{P_x})' = [p_{ww}\ \mathbf{p}_{wx}, \mathbf{p}_{xw}\ \mathbf{P}_{xx}]$; $\mathbf{G_i} = (\mathbf{G_{iw}}\ \mathbf{G_{ix}})' = [(g_{iww}\ \mathbf{g}_{iwx}), (\mathbf{g}_{ixw}\ \mathbf{G}_{ixx})]$.

From 11, the single equation for the (log) real wage is:

12. $\Delta w_t = b_{w0} + b_{w1} t + \mathbf{P}_w\ \mathbf{z}_{t-1} + \Sigma_i \mathbf{G}_{wi}\ \Delta\ \mathbf{z}_{t-i} + \varepsilon_{yt}$ $\qquad t = 1, 2, ...; i = 1, ..m-1$

In the following analysis, the focus will not be on 12, but rather on modelling w_t *conditionally* to the realizations of the variables in the vector $\mathbf{x}_t$ and given past values of w_t and $\mathbf{x}_t$.

The error term in 12., ε_{yt}, may be expressed conditionally in terms of ε_{xt} as:

13. $\varepsilon_{yt} = \varpi\ e_{xt} + v_t$

where $\varpi = w_{wx} W_{\mathbf{xx}}^{\mathbf{-1}}$, and where the error term v_t is independent of e_{xt} .[7]

Substituting the expression for ε_{yt} in 12, and given the expression for e_{xt} derivable from 11, the *conditional ECM* model for the real wage may be written as:

14. $\Delta w = c_0 + c_1 t + \varpi \Delta \mathbf{x}_t + \mathbf{P}_{w.x}\ \mathbf{z}_{t-1} + \Sigma_i G_i \Delta \mathbf{z}_{t-i} + v_t$ $\qquad t = 1, 2, ...; i = 1, ..m-1$

where $c_0 = b_{w0} - \varpi \mathbf{b}_{x0}$, $c_1 = b_{w1} - \varpi \mathbf{b}_{x1}$, $\mathbf{P}_{w.x} = \mathbf{P}_w - \varpi \mathbf{P}_x$ and $G_i = \mathbf{G}_{iw} - \varpi \mathbf{G}_{ix}$

If the lagged level of the (log) real wage, w_{t-1}, does not enter the sub-VAR model for $\mathbf{x}$, which is if $\mathbf{p}_{xw} = 0$[8], the conditional ECM model for w simplifies to:

15. $\Delta w_t = c_0 + c_1 t + \varpi \Delta \mathbf{x}_t + p_{ww} w_{t-1} + \mathbf{p}_{wx.x}\ \mathbf{x}_{t-1} + \Sigma_i G_i \Delta \mathbf{z}_{t-i} + v_t$ $\quad t = 1, 2, ...; i = 1, ..m-1$

Equation 15. is the short run, dynamic, wage equation whose parameters will be directly estimated. Notice that since by construction the error term v_t is uncorrelated with $\Delta \mathbf{x}_t$ [9] the equation can be

[7] See Pesaran, Shin and Smith (2001). In particular the series of u_t will be independently distributed with zero mean and with variance $\omega_{uu} = \omega_{ww} - w_{wx} W_{\mathbf{xx}}^{\mathbf{-1}}\ w_{xw}$.

[8] Which means: $\Delta x_t = b_{x0} + b_{x1} t + \mathbf{P}_{xx}\ \mathbf{x}_{t-1} + \sum_i \mathbf{G}_{xi}\ \Delta\ \mathbf{z}_{t-i} + \varepsilon_{xt}$

[9] v_t is independent of ε_{xt}

estimated consistently by LS. Notice also that the equation is identified, under the hypothesis that the lagged level of the (log) real wage, w_{t-1}, does not enter the determination of $\Delta\mathbf{x}_t$.[10]

This assumption also implies that that there is only one (if any) *conditional long-run level relationship* between w_t and the conditioning variables $\mathbf{x}_t$., whose expression can be derived as the long run, equilibrium solution of 15, under appropriate conditions (see Pesaran, Shin and Smith (2001)):

16. $w_t = d_0 + d_1 t + \mathbf{d}\,\mathbf{x}_t + u_t$

where $d_0 = - c_0/p_{ww}$, $d_1 = - c_1/p_{ww}$, $\mathbf{d} = - \mathbf{p}_{wx.x}/p_{ww}$, and u_t is zero mean and stationary.

One can see, from 16 and 15, that if all the (estimated) coefficients of lagged levels in the conditional ECM 15 are different from zero, i.e. $p_{ww}\neq0$ and $\mathbf{p}_{wx.x}\neq0$, the long run level relationship 16 between w_t and the conditioning variables $\mathbf{x}_t$ is well behaved. It can be degenerate in case changes in the log real wage only depend on its own past level and not on past levels of the conditioning variables, i.e. if $p_{ww}\neq0$ and $\mathbf{p}_{wx.x}=\mathbf{0}$,[11] or when $p_{ww}=0$ and $\mathbf{p}_{wx.x}\neq\mathbf{0}$. Finally, if all the coefficients of lagged levels in the conditional ECM are zero, i.e. if $p_{ww}=0$ and $\mathbf{p}_{wx.x}=\mathbf{0}$, then there cannot be any long run level relationship between w_t and $\mathbf{x}_t$.

Pesaran Shin and Smith (2001) develop a bound procedure in order to test for the absence of level effects in conditional ECMs like 15., and thus to ascertain the existence of a level relationship between the dependent variable and the conditioning variables. The first step of the procedure is an F-test of the null hypothesis that there are no level effects in the conditional ECM 15., i.e. H'_0: $p_{ww}=0$ and $\mathbf{p}_{wx.x}=\mathbf{0}$. The authors provide the asymptotic critical value bounds for such F-statistic. If the computed test falls inside the critical value bound the null hypothesis is accepted, and the test is inconclusive as to inferring the existence of a long run level relationship. If the test falls outside the bounds and the hypothesis is rejected, the second step of the procedure is to test the null hypothesis that the coefficient of the lagged level of the dependent variable in 15. is zero, i.e. H_0'': $p_{ww}=0$ by means of a t-test whose asymptotic critical value bounds are also provided by the authors. If the test falls outside the critical value bound the hypothesis is rejected, confirming the existence of a long run level relationship between w_t and $\mathbf{x}_t$.[12] Estimates of the long run "core" parameters may then be derived from the estimated parameters of the short run conditional ECM model 15.

[10] See Manning (1993) or Bean (1994) for discussions on the thorny issue of identification of wage equations. The hypothesis, in words, means that lagged real wages do not enter the equations for changes in the explanatory variables (productivity changes or unemployment changes, for example). It does not exclude, however that lagged changes the real wage enter these equations.

[11] Which means (from 16.) that w_t is trend stationary

[12] The relationship may however be degenerate if all lagged levels of the conditioning variables are zero, i.e. $\mathbf{p}_{wx.x}=\mathbf{0}$.

3.2 The estimates

In what follows, the above methodology is used in order to assess the existence of a long run level relationship between the real wage and the set of explanatory variables **x**[13], and to derive the "core" long run wage setting parameters for each of 20 OECD countries[14].

Data for unemploment, productivity, taxes, union's bargaining strength, and replacement rates are from the IMF labour market institution database[15] (IMF (2003)). In particulare union density is used as a measure of union bargaining strength, and the variable "wedge" (equal to the sum of employment, direct and indirect tax rates) is used as a compact measure for the different kind of taxes appearing in equation 8. As a measure of the real wage real total compensation per employee is used[16], from OECD source[17]. The time series data are annual, and cover the longest time span available for each country. This is 1960-1999 where possible, but for many countries, data availability problems shorten the time span, excluding years of the earlier decade[18].

For each country, the following steps were followed.

First, the conditional ECM 15 was estimated by LS, both including and excluding the trend term, and for different specifications of the lag lenght m; in particular given annual data, specifications with m=2 and m=1 were estimated (with and without time trend). To ensure comparability across different choices of lags all estimates used the same sample period, always reserving the first 2 observations for lags. Notice that since the conditional ECM specification 15 assumes that the errors v_t are serially uncorrelated, the choice of the appropriate lag length in the model is particularly important. Tests on the appropriate specification were therefore performed, namely the Akaike and Schwartz information criteria for the choice of lag lenght, and the LM test for the hypothesis of no first and second order residual autocorrelation (F and chi). Table 1 reports the results of these specification test. For 13 countries, the statistics allow to single out "the" preferred specification, since the Akaike and the Schwartz information criteria give the same indication as to the choice of lags, and the LM tests (Chi and F) signal no problem of residual autocorrelation. For 7 countries a unique choice is not possible, either because the two information criteria give contrasting results as to the correct choice of lags, or because the LM tests signal autocorrelation

[13] Remember that these are: unemployment, productivity, employment and income taxes, union bargaining strenght and the replacement ratio.

[14] The countries considered are: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Japan, Ireland, Italy, the Nethelands, New Zeland, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, United States.

[15] The data on unemployment and productivity included in the database are from OECD source. No wage variable is included in such database.

[16] Although this is the measure most often used in empirical studies, it is not the best possible measure one may use. In general other measures, like for example the hourly wage rate would be preferable, as theoretically more correct. Data of such sort, however, are not homogeneously available for all countries, and in a multi country study problems of data comparability in addition to data availability arise.

[17] OECD Economic Outlook, n. 72, n. 73.

[18] Data from the IMF institutional database cover the period 1960-2000 for all countries. On the other end for many countries data on the real wage are missing for the sixties in the OECD Economic outlook database. The precise interval available for each country is indicated in the regressions tables.

problems for the specification choosen via such tests. In these 7 cases, the subsequent tests will be performed on all different specifications, rather than on the "preferred" specification only.

As a second step, the preferred specification was used to test for the existence of a level relationship between the real wage and unemployment, productivity, the wedge, union density and the replacement rat, using the bounds F and t-tests procedure by Pesaran-Shin and Smith (2001). Table 2 reports the F and t statistics for testing the null hypothesis that there exist no long run level relationship between the real wage and the above mentioned explanatory variables. In only one case (Spain) the bound F test is always inconclusive[19], and no inference on the existence of a level relationship can be drawn. In another case (Portugal) the F test may be conclusive or inconclusive depending on the specification of the lag order[20]. For all other countries the bound F tests always reject the null hypothesis of no level effects in the ECM relation, pointing to the existence of a long run level equation. As to the bound t-tests, in three cases (Finland, New Zealand and United Kingdom) they always accept the null, in two cases (Japan and Sweden) they may accept or reject the null depending on the specification of the lag order, while in all other cases the null is rejected, thus confirming the results of the bound F test as to the existence of a level equation for the real wage. Overall, for 13 countries[21] both the bound F and bound t-test reject the null, therefore supporting the existence of a long run level equation with no caveats. For 4 countries[22] the tests support the existence of a level relationship only for appropriate lag specifications. In 2 countries[23] the F and t tests always give contrasting results as to the existence of a level relation. Finally, for 1 country[24] inference on the (non) existence of a level relationship cannot be drawn, whatever the specification, since the F test is always inconclusive.

The third step involved the derivation of the parameters of the long run levels relationship starting from the estimations of the associated short run dynamics of wage adjustment. To this end a more parsimonious specification of the short run dynamics of wage adjustment was adopted rather than the unrestricted specification of the conditional ECM 15 previously used for the tests. As underlined in Pesaran, Shin and Smith (2001), when performing the bounds F and t tests on the existence of a level relationship it is important that all the coefficient on lagged changes in the ECM specification remain unrestricted in order to avoid pre-testing problems. This is not necessary, however, to the end of estimation of long run effects, when the use of a more parsimonious specification of short run dynamics may be more efficient. In order to choose the appropriate model, we estimated

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[19] It accepts the null hypothesis that the coefficients of lagged levels are all zero.

[20] In the specification with m=2 (which is selected by both the Akaike and the Schwartz information criteria in table 1), the F test is conclusive, rejecting the null of no level effects. For this specification, however, the Chi test signals problems of residual autocorrelation. In the specification with m=1, where the autocorrelation problems are resolved, however, the F test is inconclusive.

[21] Australia, Austria, Belgium, Canada, Denmark, France, Germany, Ireland, Italy, Netherlands, Norway, Switzerland, and theUnited States

[22] Finland, Japan and Sweden plus Portugal

[23] New Zealand and the United Kingdom)

[24] Spain

relation 15 for all possible choices of m (m=1 and m=2) for lagged changes of each variable, and used the Akaike and the Schwartz information criteria to select among the 64 estimated models. Table 3 reports the estimates of the preferred (parsimonious) conditional ECM regressions, i.e. of the short run dynamics of real wage adjustment, for each country. Instability tests (not reported, available upon request) for all countries suggested that the coefficients are generally stable over the sample periods considered. Given the low power of these tests, however, it is likely that they may have missed important breaks.[25] It is also clear that in the present context we are not able to take into account the particular features of each single country, and that our estimates can only sketch a first broad-brush picture.

Finally, the "core" parameters of the long run level equations for the real wage could be derived from the estimated parameters of of the associated short run dynamics (on the basis of equation 16). The long run parameters of interest are reported in Table 4. Overall, the level estimates are not as satisfactory as one would expect: the core coefficients are not always significant and not always have the expected sign. The (log) level of unemployment enters significantly in 13 countries, and in three of these the coefficient has the "wrong" sign. The results are slightly better for the (log) level of productivity, whose coefficient is significant for 16 countries, but has the wrong sign in 3 cases. Turning the attention to the institutional variables, notice how their effect on the level of the real wage varies considerably across countries. The wedge term has a positive and significant effect in only 8 countries, has a negative and significant effect in 3 countries, and no significant effect at all in 9 countries. Union density has a significant positive effect in 8 countries, a negative effect in 7 countries and no significant effect in 5 countries. The replacement rate has a positive effect in 5 countries, a negative effect in 6 countries and zero effects in 9 countries.

In the next paragraph the analysis on the effects of institutional variables will be pursued in more detail.

4. Institutions and cross country differences in the wage setting parameters.

One can now try to give a first, rough answer to the question which is the focus of this paper: do institutions matter in the explanation of cross country differences in the key wage setting parameters?

For simplicity, think of the wage relation in two dimensions, i.e. on the unemployment-real wage plane. In this setting it is clear that labor market institutions may have both a level effect, i.e. change the level of the real wage for any given level of the unemployment rate, and a slope effect, i.e. change the responsiveness of the real wage to the unemployment rate. This is a key parameter not only in the determination of the "natural" rate of unemployment, but most importantly in

[25] The issue is obviously very relevant for our analysis, but cannot and will not not be pursued in this paper. Individuation of important break points for each country is the subject of current research.

detemining the overall "flexibility" of an economic system, and its ability to recover after being hit by exogenous macroeconomic shocks.

The time-series results of the previous paragraph already shed some light on the level effect of institutional variables, the wedge, union density and the replacement rate in particular, for each country.

Focus now on the slope effect. In particular, following the lead of Layard, Nickell and Jackman (1991)[26] we may use the results from the previous paragraph to investigate, in a cross country framework, the extent to which cross country differences in the responsiveness of the real wage to unemployment are attributable to cross country differences in institutional features.

But which are the institutional features which are likely to matter in determining the different effects of unemployment on wages? One of the factors that earlier empirical macro-literature has focussed on is the degree of centralization/coordination of wage bargaining (for example Bean, Layard and Nickell (1986), Alogoskoufis and Manning (1988), Newell and Symons (1985,1987)). Since centralized / coordinated unions are more likely to internalize the aggregate consequences of their decisions, an higher degree of centralization/coordination is expected to increase the wage responsiveness to unemployment. Layard, Nickell and Jackman (1991)[27] have highlighted as other possible factors the unemployment benefit structure (duration, level and coverage of the unemployment benefits), as well as factors which ease the exercise of insider power. More generous unemployment benefit structures are expected to lower the responsiveness of wages to unemployment, since they reduce the disutility of being unemployed; factors that ease the exercise of insider power, in turn, are expected to lower the responsiveness of wages to unemployment since they lower the extent to which the disutility of being unemployed is reflected in lower wage demands.

To investigate the above effects in our sample of OECD countries, the cross section data given by the estimated elasticities of the real wage to unemployment (from Table 4), taken in absolute value, were regressed on the following set of institutional variables available from the IMF Labour market institution database: bargaining coordination (BC), benefit replacement rates (BRR) and benefit duration (BD) as determinants of the unemployment benefit structure, union density (UDEN) and employment protection (EP) (as factors easing the exercise of insider power). For each country the values of institutional variables are averages over the sample period used for the estimation of the wage setting equation. Negative coefficients are expected for BRR, BD, UDEN and EP, which should lower the (absolute value of) the wage response to unemployment, and a positive coefficient is expected for BC, which should increase the absolute value of wage elasticity to unemployment.

[26] Chapter 9, section 4.
[27] Chapter 4, section 5, and chapter 9 section4.

Table 5a reports the results for the whole sample of countries (20 observations), while Table 5b restricts the sample of countries to those with a negative unemployment coefficient (15 observations). A glance to the p-values of the coefficients and to the F-tests for overall significance reveals that none of the institutional variables considered has a significant effect in any of the specifications adopted. In Table 5c the sample is further restricted to those countries with a negative and significant unemployment coefficient (10 observations). Obviously the results of this table must be taken with caution, since very few degrees of freedom are left.[28] Benefit replacement rates and union density continue to be insignificant in all specifications. The results are more encuraging for benefit duration, whose coefficient is significant and has the expected sign in the specifications of colums (2), (3) and (4) (notice however that in colums (2) and (3) the F-test for overall significance does not reject the hypothesis that all coefficients are zero). In the specification of column (4) also bargaining coordination and employment protection are significant (the latter only at 10%), but the signs of their coefficients are the opposite of those expected : the wage seems to be more "flexible" to unemployment changes where the degree of bargaining coordination is lower and the degree of employment protection is higher.

5. Conclusions

One of the main channels through which labour market institutions are supposed to work in determining macroeconomic performance, and the unemployment rate in particular, is trough their effects on the key parameters of the wage setting function, particularly the responsiveness of the real wage to the unemployment rate. The question this paper tried to address is whether there is empirical evidence in support of this particular "transmission mechanism".

Our explorative analysis found little support for the role of labour market institutions in explaining inter-country differences in the elasticity of the real wage to unemployment. More specifically, we found no evidence whatsoever that benefit replacemente rates and union density have any significant effect, while we found some evidence that, in a restricted group of countries, benefit duration, bargaining coordination and employment protection may have some significant effects. However, while in the case of benefit duration, the detected effect is in line with what expected (namely, benefit duration decreases the wage responsiveness to unemployment) this is not the case for bargaining coordination and employment protection: the results in fact suggest that the real wage seems to be more responsive to unemployment changes in those countries with lower degrees of bargaining coordination and higher degrees of employment protection.

As to the "level effects" of labour market institutions, the time series analysis conducted for each of the twenty countries suggests that the effects of the tax wedge, union density and benefit

[28] Only 4 degrees of freedom remain in colum (4), 5 in column (3), 6 in column (2) and 7 in column (1).

replacement ratios on the level of the real wage are not univocal: these are positive in some countries, negative in others and zero in a substantial part of the sample[29].

The analysis of this paper is still preliminary, and can be refined and extended in several directions[30]. But overall these preliminary results suggest that one should be very careful when recurring to institutional explanations of high unemployment, or when suggesting universal and univocal institutional reforms as "the" best solutions to unemployment problems. Whether there is any robust direct link between labour market institutions and unemployment[31] it does not seem to be the result of the main transmission mechanism which the theory indicates.

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[29] The wedge term has a positive effect in 8 countries, a negative effect in 3 countries and no significant effects in 9 countries. Union density has positive effects in 8 countries, negative effects in 7 countries and no effects in 5 countries. Benefit replacement rates have a positive effect in 5 countries, avnegative effect in 6 countries and no significant effect in 9 countries.

[30] We are currently working to refine the estimates of the individual wage setting functions, taking into account appropriate characteristics for each country, and trying to detect structural breaks in the wage elasticity to unemployment. Analyzing the effects of institutions on the parameters of a complete system of wage setting and prie setting is also in the agenda.

[31] But the issue is dubious. See for example Baker et al. et al (2002) and Zenezini (2004).

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Table 1.
Statistics for selection of lag order*

Australia

	With deterministic trend (significant)				Without deterministic trend			
m	AIC	SC	Chi(2)	F(2)	AIC	SC	Chi(2)	F(2)
2	-10.5652	-9.62295	10.98 [0.00]	1.99 [0.29]	-10.4892	-9.59651	8.44 [0.00]	1.87 [0.27]
1	-8.90491	-8.26020	1.60 [0.19]	0.66 [0.44]	-8.98178	-8.38666	2.51 [0.11]	1.16 [0.31]

Austria

	With deterministic trend (not significant)				Without deterministic trend			
m	AIC	SC	Chi(2)	F(2)	AIC	SC	Chi(2)	F(2)
2	-9.46480	-8.59452	3.75 [0.15]	0.73 [0.50]	-9.52710	-8.70263	3.61 [0.16]	0.76 [0.49]
1	-9.14361	-8.54815	9.34 [0.01]	3.50 [0.05]	-9.19926	-8.64961	7.05 [0.03]	2.54 [0.11]

Belgium

	With deterministic trend (significant at 10%)				Without deterministic trend			
m	AIC	SC	Chi(2)	F(2)	AIC	SC	Chi(2)	F(2)
2	-8.74294	-7.83106	18.52 [0.00]	15.3 [0.01]	-8.41812	-7.55423	11.31 [0.00]	5.77 [0.04]
1	-8.09677	-7.47285	8.71 [0.01]	2.856 [0.10]	-7.91206	-7.33613	4.16 [0.12]	1.18 [0.33]

Canada

	With deterministic trend (not significant)				Without deterministic trend			
m	AIC	SC	Chi(2)	F(2)	AIC	SC	Chi(2)	F(2)
2	-8.36069	-7.48180	2.61 [0.27]	0.46 [0.64]	-8.24566	-7.41302	1.43 [0.49]	0.27 [0.77]
1	-7.93223	-7.33088	7.68 [0.02]	2.64 [0.10]	-7.86722	-7.31213	3.85 [0.15]	1.21 [0.32]

Denmark

	With deterministic trend (not significant)				Without deterministic trend			
m	AIC	SC	Chi(2)	F(2)	AIC	SC	Chi(2)	F(2)
2	-7.81591	-6.89654	16.51 [0.00]	10.4 [0.02]	-7.86342	-6.99243	9.81 [0.00]	4.244 [0.08]
1	-7.99177	-7.36272	4.49 [0.11]	1.15 [0.35]	-7.98355	-7.40289	2.02 [0.36]	0.51 [0.62]

Finland

	With deterministic trend (not significant)				Without deterministic trend			
m	AIC	SC	Chi(2)	F(2)	AIC	SC	Chi(2)	F(2)
2	-8.05516	-7.22793	6.97 [0.03]	1.86 [0.19]	-8.10409	-7.32040	6.43 [0.04]	1.79[0.20]
1	-8.08217	-7.51617	5.4417 [0.07]	1.90 [0.17]	-8.12224	-7.59978	4.63 [0.10]	1.65 [0.21]

France

	With deterministic trend (significant)				Without deterministic trend			
m	AIC	SC	Chi(2)	F(2)	AIC	SC	Chi(2)	F(2)
2	-9.35452	-8.48424	3.05 [0.22]	0.58 [0.58]	-9.14999	-8.32552	10.76 [0.00]	3.04 [0.09]
1	-9.47334	-8.88381	0.613 [0.74]	0.17 [0.84]	-9.13472	-8.59054	4.76 [0.09]	1.60 [0.23]

***AIC and SC are Akaike and Schwartz information criteria respectively. Higher values indicate preferred specifications.Chi(2) and F(2) are the statistics for the LM test for residual autocorrelation against lags 1 to 2; their p-values are reported in square brackets, and degrees of freedom in brackets.*

Table 1 – Continues
Statistics for selection of lag order*

Germany

	With deterministic trend (not significant)				Without deterministic trend			
m	AIC	SC	Chi(2)	F(2)	AIC	SC	Chi(2)	F(2)
2	-8.44715	-7.61993	1.53 [0.47]	0.34 [0.71]	-8.48467	-7.70098	1.28 [0.53]	0.30 [0.74]
1	-8.15583	-7.58983	6.25 [0.04]	2.24 [0.13]	-8.19525	-7.67279	7.00 [0.03]	2.68 [0.09]

Japan

	With deterministic trend (significant)				Without deterministic trend			
m	AIC	SC	Chi(2)	F(2)	AIC	SC	Chi(2)	F(2)
2	-9.29632	-8.42604	16.18 [0.00]	5.63 [0.02]	-8.75189	-7.92741	9.45 [0.01]	2.51 [0.12]
1	-9.19944	-8.60399	10.67 [0.00]	4.25 [0.03]	-8.80363	-8.25398	7.26 [0.03]	2.64 [0.10]

Ireland

	With deterministic trend (significant)				Without deterministic trend			
m	AIC	SC	Chi(2)	F(2)	AIC	SC	Chi(2)	F(2)
2	-8.90603	-7.98666	2.90 [0.09]	0.75 [0.42]	-8.52176	-7.65077	5.48 [0.02]	1.87 [0.21]
1	-8.24061	-7.61156	5.44 [0.07]	1.46 [0.27]	-7.86574	-7.28508	10.13 [0.00]	3.83 [0.05]

Italy

	With deterministic trend (significant for m=2, not significant for m=1)				Without deterministic trend			
m	AIC	SC	Chi(2)	F(2)	AIC	SC	Chi(2)	F(2)
2	-8.03558	-7.20835	0.660 [0.72]	0.15 [0.87]	-7.81515	-7.03146	5.95 [0.05]	1.63 [0.23]
1	-8.01177	-7.44577	1.10 [0.58]	0.34 [0.72]	-7.98818	-7.46572	1.73 [0.42]	0.56 [0.58]

Netherlands

	With deterministic trend (significant)				Without deterministic trend			
m	AIC	SC	Chi(2)	F(2)	AIC	SC	Chi(2)	F(2)
2	-9.89091	-8.98691	1.84 [0.18]	0.56 [0.47]	-8.89665	-8.04023	3.17 [0.07]	1.15 [0.31]
1	-8.91129	-8.29277	0.902 [0.64]	0.216 [0.81]	-8.63841	-8.06746	4.92 [0.09]	1.49 [0.26]

Newzeland

	With deterministic trend (not significant)				Without deterministic trend			
m	AIC	SC	Chi(2)	F(2)	AIC	SC	Chi(2)	F(2)
2	-7.85995	-6.93360	2.89 [0.09]	0.66 [0.46]	-7.63507	-6.75748	4.61 [0.03]	1.36 [0.29]
1	-7.09714	-6.46333	1.57 [0.46]	0.34 [0.72]	-7.15976	-6.57469	1.95 [0.38]	0.46 [0.64]

Norway

	With deterministic trend (not significant)				Without deterministic trend			
m	AIC	SC	Chi(2)	F(2)	AIC	SC	Chi(2)	F(2)
2	-9.66160	-8.71934	15.67 [0.00]	4.95 [0.16]	-9.75142	-8.85875	13.96 [0.00]	5.20 [0.11]
1	-8.54891	-7.90420	2.27 [0.13]	0.92 [0.37]	-8.53136	-7.93624	2.32 [0.13]	1.06 [0.33]

***AIC and SC are Akaike and Schwartz information criteria respectively. Higher values indicate preferred specifications.Chi(2) and F(2) are the statistics for the LM test for residual autocorrelation against lags 1 to 2; their p-values are reported in square brackets, and degrees of freedom in brackets.*

Table 1 – Continues

Statistics for selection of lag order*

Portugal

With deterministic trend (not significant)					Without deterministic trend			
m	AIC	SC	Chi(2)	F(2)	AIC	SC	Chi(2)	F(2)
2	-7.12932	-6.18705	19.64 [0.00]	16.7 [0.06]	-7.19872	-6.30605	17.95 [0.00]	13.30 [0.04]
1	-6.67736	-6.03556	0.62 [0.43]	0.25 [0.63]	-6.71908	-6.12664	0.23 [0.63]	0.10 [0.76]

Spain

With deterministic trend (significant)					Without deterministic trend			
m	AIC	SC	Chi(2)	F(2)	AIC	SC	Chi(2)	F(2)
2	-7.85679	-6.98651	26.52 [0.00]	26.59 [0.00]	-7.82074	-6.99627	22.11 [0.00]	13.42 [0.00]
1	-7.93332	-7.33786	11.22 [0.00]	4.59 [0.03]	-7.84871	-7.29906	2.98 [0.23]	0.93 [0.41]

Sweden

With deterministic trend (significant)					Without deterministic trend			
m	AIC	SC	Chi(2)	F(2)	AIC	SC	Chi(2)	F(2)
2	-8.07002	-7.21705	13.73 [0.00]	4.41 [0.03]	-7.58855	-6.78048	7.40 [0.02]	1.95 [0.18]
1	-7.96519	-7.38158	5.49 [0.06]	1.83 [0.19]	-7.80142	-7.26270	3.70 [0.16]	1.22 [0.32]

Switzerland

With deterministic trend (significant for m=2, not significant for m=1)					Without deterministic trend			
m	AIC	SC	Chi(2)	F(2)	AIC	SC	Chi(2)	F(2)
2	-10.9555	-10.0104	20.057 [0.00]	21.27 [0.14]	-8.75350	-7.85820	4.42 [0.04]	0.53 [0.54]
1	-8.90345	-8.25684	0.84 [0.36]	0.29 [0.61]	-8.72130	-8.12443	1.8 [0.18]	0.77 [0.41]

United Kingdom

With deterministic trend (not significant)					Without deterministic trend			
m	AIC	SC	Chi(2)	F(2)	AIC	SC	Chi(2)	F(2)
2	-8.65111	-7.79815	3.48 [0.18]	0.74 [0.50]	-8.69320	-7.88513	3.44 [0.18]	0.78897
1	-8.19752	-7.61391	8.52 [0.01]	3.17 [0.06]	-8.23273	-7.69401	9.44 [0.01]	3.84 [0.04]

United States

With deterministic trend (significant)					Without deterministic trend			
m	AIC	SC	Chi(2)	F(2)	AIC	SC	Chi(2)	F(2)
2	-10.0460	-9.21875	6.75 [0.03]	1.78 [0.20]	-10.0011	-9.21740	6.78 [0.03]	1.91 [0.18]
1	-9.93733	-9.37133	1.48 [0.48]	0.46 [0.64]	-9.53195	-9.00949	0.26 [0.88]	0.08 [0.92]

***AIC and SC are Akaike and Schwartz information criteria respectively. Higher values indicate preferred specifications.Chi(2) and F(2) are the statistics for the LM test for residual autocorrelation against lags 1 to 2; their p-values are reported in square brackets, and degrees of freedom in brackets.*

Table 2
Statistics for testing the existence of a long run level relationship*
(relevant specification(s) highlighted)

Australia

	With deterministic trend (not significant)		Without deterministic trend	
m	***Fv***	***tv***	***Fiii***	***tiii***
2	9.87911**	-2.03**	11.7611**	-2.01**
1	1.43848**	-1.73**	4.61088**	-2.27**

Austria

	With deterministic trend (not significant)		Without deterministic trend	
m	***Fv***	***tv***	***Fiii***	***tiii***
2	1.43848**	-1.73**	4.61088**	-2.27**

Belgium

	With deterministic trend (significant at 10%)		Without deterministic trend	
m	***Fv***	***tv***	***Fiii***	***tiii***
2	1.45228**	-2.86**	2.03376**	-1.80**
1	1.94442**	-2.74**	1.55604**	-1.79**

Canada

	With deterministic trend (not significant)		Without deterministic trend	
m	***Fv***	***tv***	***Fiii***	***tiii***
2	6.38346**	-4.58**	5.58308**	-4.65**

Denmark

	With deterministic trend (not significant)		Without deterministic trend	
m	***Fv***	***tv***	***Fiii***	***tiii***
1	2.13222**	-1.65**	1.971**	-2.19**

Finland

	With deterministic trend (not significant)		Without deterministic trend	
m	***Fv***	***tv***	***Fiii***	***tiii***
1	7.1472**	-2.68**	8.7266**	-4.06

France

	With deterministic trend (significant)		Without deterministic trend	
m	***Fv***	***tv***	***Fiii***	***tiii***
1	3.05932**	-2.20**	2.97066	-0.365**

Germany

	With deterministic trend (not significant)		Without deterministic trend	
m	***Fv***	***tv***	***Fiii***	***tiii***
2	0.913752**	-1.09**	1.98362**	-1.02**

Japan

	With deterministic trend (significant)		Without deterministic trend	
m	***Fv***	***tv***	***Fiii***	***tiii***
2	4.75421**	-3.22**		
1	7.79363**	-3.70	6.97618**	-1.34**

Ireland

	With deterministic trend (significant)		Without deterministic trend	
m	***Fv***	***tv***	***Fiii***	***tiii***
2	7.98306**	-6.23**	5.53995**	-5.04**

*Fv tests for the hypothesis that p_{ww}=0 and $\mathbf{p}_{wx.x}$=**0** in model 15 (test for the absence of a level relationship).*
tv tests for the hypothesis that p_{ww}=0 in model 15
Fiii tests for the hypothesis that p_{ww}=0 and $\mathbf{p}_{wx.x}$=0 in model 15 without trend.
tv tests for the hypothesis that p_{ww}=0 in model 15 without trend.
*** indicates that the test falls outside the critical value bounds provided in Pesaran Shin and Smith (2001),and thus the hypothesis that there are no level effecs is rejected.*

Table 2 - Continues

Statistics for testing the existence of a long run level relationship*

(relevant specification(s) highlighted)

Italy

	With deterministic trend (significant for m=2, not for m=1)		Without deterministic trend	
m	***Fv***	***tv***	***Fiii***	***tiii***
2	1.8736**	-1.43**		
1	2.50083**	-1.70**	7.69376**	-2.05**

Netherlands

	With deterministic trend (significant)		Without deterministic trend	
m	***Fv***	***tv***	***Fiii***	***tiii***
2	7.32445**	-5.04**	1.71601**	-1.79**

New Zeland

	With deterministic trend (not significant)		Without deterministic trend	
p	***Fv***	***tv***	***Fiii***	***tiii***
2	4.62104**	-3.69	3.97501**	-3.21

Norway

	With deterministic trend (not significant)		Without deterministic trend	
m	***Fv***	***tv***	***Fiii***	***tiii***
2	3.19791	-0.530**	4.81005**	-0.795**
1	1.54798**	-1.95**	2.15798**	-1.81**

Portugal

	With deterministic trend (not significant)		Without deterministic trend	
m	***Fv***	***tv***	***Fiii***	***tiii***
2	0.96998**	-0.444**	2.52854**	-1.86**
1	1.96146**	-1.56**	3.11859	-1.62 **

Spain

	With deterministic trend (significant)		Without deterministic trend	
m	***Fv***	***tv***	***Fiii***	***tiii***
1	3.24285	-2.26**	3.20805	-2.09**

Sweden

	With deterministic trend (significant)		Without deterministic trend	
m	***Fv***	***tv***	***Fiii***	***tiii***
2	5.22388**	-4.65**	2.29781**	-2.61
1	5.61556**	-3.76	4.69803**	-2.74

Switzerland

	With deterministic trend (significant for m=2, not for m=1)		Without deterministic trend	
m	***Fv***	***tv***	***Fiii***	***tiii***
2	7.95651**	-4.96**	0.754292**	-1.07**
1	2.36792**	-2.67**	1.71955**	-2.32**

United Kingdom

	With deterministic trend (not significant)		Without deterministic trend	
m	***Fv***	***tv***	***Fiii***	***tiii***
2	4.30125**	-3.67	7.38603**	-3.76

United States

	With deterministic trend (significant)		Without deterministic trend	
m	***Fv***	***tv***	***Fiii***	***tiii***
1	6.08017**	-4.50**	2.87348	-3.01

*******Fv tests for the hypothesis that $p_{ww}=0$ and $\mathbf{p}_{wx.x}=\mathbf{0}$ in model 15 (test for the absence of a level relationship).*

tv tests for the hypothesis that $p_{ww}=0$ in model 15

Fiii tests for the hypothesis that $p_{ww}=0$ and $\mathbf{p}_{wx.x}=0$ in model 15 without trend.

tv tests for the hypothesis that $p_{ww}=0$ in model 15 without trend.

*** indicates that the test falls outside the critical value bounds provided in Pesaran Shin and Smith (2001), thus rejecting the hypothesis that there are no level effecs.*

Table 3.

Estimated short run dynamics of real wage changes

Dependent variable: $\Delta\log(w)_t$ t-statistics in parenthesis, p-values in square brackets

	Australia	Austria	Belgium	Canada	Denmark
Constant	13.6575 (10.8)	0.2528 (0.940)	-7.1795 (-3.41)	-1.4196 (-2.76)	-2.6519 (-0.58)
Trend			-0.0279 (-3.28)		
$\log(w)_{t-1}$	-1.3431 (-8.46)	-0.2044 (-2.63)	-0.7637 (-4.40)	-0.7875 (-5.08)	-0.2385 (-1.57)
$\Delta\log(w)_{t-1}$	-0.2197 (-1.98)		0.5104 (2.82		
$\log(UR)_{t-1}$	0.2725 (7.02)	-0.0045 (-0.841)	-0.0247 (-1.70)	-0.1339 (-4.06)	-0.0074 (-0.134)
$\Delta\log(UR)_t$	0.16325 (8.22)	-0.0277 (-2.01)	0.0035 (0.114)	-0.01616 (-0.326)	0.01865 (0.565)
$\Delta\log(UR)_{t-1}$	-0.13837 (-4.94)			0.0580 (1.57)	0.04039 (1.48)
$\log(PROD)_{t-1}$	-0.66145 (-3.60)	0.0925 (0.836)	1.85840 (3.90)	0.6345 (1.80)	0.71042 (1.66)
$\Delta\log(PROD)_t$	-0.5700 (-2.66)	-0.2599 (-2.27)	0.9586 (2.91)	0.8668 (2.38)	0.0212 (0.0495)
$\Delta\log(PROD)_{t-1}$			-1.0250 (-3.71)		
$\log(WGE)_{t-1}$	-0.20711 (-3.29)	-0.0006 (-0.008)	0.5241 (2.98)	0.0540 (0.268)	-0.00509 (-0.0506)
$\Delta\log(WGE)_t$	-0.2243 (-2.16)	-0.1641 (-2.15)	-0.0904 (-0.56)	0.1384 (1.29)	0.08768 (0.367)
$\Delta\log(WGE)_{t-1}$	-0.06539 (-1.01)				
$\log(UDEN)_{t-1}$	-0.7081 (-8.52)	0.0302 (0.674)	0.4080 (3.23)	0.4211 (2.14)	-0.5037 (-2.34)
$\Delta\log(UDEN)_t$	-0.01229 (-0.208)	-0.3927 (-2.68)	-0.1197 (-0.554)	-0.0361 (-0.165)	-0.5061 (-1.66)
$\Delta\log(UDEN)_{t-1}$		-0.5369 (-3.84)			
$\log(BRR)_{t-1}$	-0.4990 (-5.15)	0.0432 (2.55)	-0.1172 (-0.986)	0.1766 (4.40)	0.6433 (1.01)
$\Delta\log(BRR)_t$	0.1421 (1.43)	0.02933 (1.71)	-0.0452 (-0.180)	0.1391 (2.94)	0.83450 (1.73)
$\Delta\log(BRR)_{t-1}$	-0.4467 (-2.72)			-0.1681 (-2.74)	-0.6692 (-1.44)
n. obs.	22	32	27	31	26
R^2	0.990157	0.922727	0.920305	0.75347	0.694557
F overall	40.24 [0.000]	18.91 [0.000]	9.898 [0.000]	3.997[0.004]	2.099 [0.105]
DW	2.45	2.14	2.96	1.86	2.32
AR 1-2 test: F	1.2020 [0.3229]	0.4234 [0.6615]	8.1191[0.0080]	0.2068[0.8155]	1.5853 [0.2523]
AR 1-2 test c^2		1.5185 [0.4680]	16.710[0.0002]	0.8318 [0.6598]	6.2591 [0.0437]
RESET test:	3.3516 [0.1266]	0.66029[0.4271]	0.09262 [0.7666]	0.00477 [0.9458]	1.8810 [0.1975]

Table 3. - Continues

Estimated short run dynamics of real wage changes

Dependent variable: $\Delta\log(w)_t$ t-statistics in parenthesis, p-values in square brackets

	Finland	France	Germany	Japan	Ireland
Constant	-0.1473 (-0.78)	-2.632 (-2.62)	0.6525 (0.423)	-0.9285 (-1.45)	8.302 (4.80)
Trend		-0.0068 (-3.01)		-0.0118 (-3.84)	0.0701 (5.03)
$\log(w)_{t-1}$	-0.2731 (-3.69)	-0.1635 (-1.89)	-0.1448 (-1.52)	-0.6963 (-3.87)	-1.683 (-7.29)
$\Delta\log(w)_{t-1}$			0.2490 (1.63)		0.3147 (2.12)
$\log(UR)_{t-1}$	-0.02301 (-2.12)	-0.02638 (-1.15)	-0.01742 (-1.27)	0.05397 (2.28)	0.07624 (2.39)
$\Delta\log(UR)_t$	-0.02005 (-1.41)	0.03932 (1.86)	-0.04570 (-4.28)	-0.01346 (-0.364)	0.01448 (0.614)
$\Delta\log(UR)_{t-1}$	0.03577 (-2.11)				
$\log(PROD)_{t-1}$	0.1740 (1.92)	0.3565 (2.93)	0.1586 (1.46)	0.9178 (3.97)	-0.8305 (-2.36)
$\Delta\log(PROD)_t$	0.1736 (1.02)	0.4840 (1.88)	0.5155 (5.06)	0.4653 (3.69)	-0.1940 (-0.745)
$\Delta\log(PROD)_{t-1}$			-0.2887 (-2.85)	-0.3216 (-1.50)	
$\log(WGE)_{t-1}$	-0.01814 (-0.198)	0.4359 (1.97)	0.008595 (0.0432)	-0.09296 (-1.14)	-0.4755 (-5.23)
$\Delta\log(WGE)_t$	0.01638 (0.190)	0.3900 (2.21)	0.02974 (0.221)	-0.08411 (-1.03)	-0.1846 (-4.01)
$\Delta\log(WGE)_{t-1}$		-0.2182 (-1.68)	0.4745 (2.91)		0.1192 (2.18)
$\log(UDEN)_{t-1}$	0.1005 (2.34)	0.03025 (1.59)	0.04163 (0.437)	0.1326 (1.17)	0.6159 (3.64)
$\Delta\log(UDEN)_t$	0.02121 (0.213)	0.1424 (2.20)	0.2075 (0.966)	0.1355 (1.60)	0.6299 (3.88)
$\Delta\log(UDEN)_{t-1}$					0.36630 (1.45)
$\log(BRR)_{t-1}$	0.0777 (2.72)	0.0347 (0.676)	-0.2366 (-0.709)	0.0578 (2.71)	-0.0157 (-0.422)
$\Delta\log(BRR)_t$	0.07213 (1.97)	-0.01534 (-0.273)	-0.2844 (-1.18)	0.06287 (1.75)	0.0112 (0.287)
$\Delta\log(BRR)_{t-1}$	-0.04526 (-1.23)			-0.07936 (-2.45)	0.04825 (1.16)
n. obs.	37	33	37	32	26
R^2	0.853249	0.913795	0.91763	0.968012	0.950307
F overall	10.29 [0.000]	15.49 [0.000]	17.51 [0.000]	36.75 [0.000]	10.76 [0.001]
DW	2.09	2.08	1.89	2.67	2.56
AR 1-2 test: F	1.6689[0.2125]	1.5730[0.4554]	0.34595 0.7117]	4.4315[0.0307]	1.4885[0.2572]
AR 1-2 test c^2	5.0745[0.0791]	0.42545[0.6602]	1.2372 [0.5387]	11.885[0.0026]	4.0786[0.0434]
RESET test:	3.1537[0.0896]	0.20676[0.6548]	0.52974[0.4748]	1.0573[0.3191]	4.2838[0.0723]

Table 3. - Continues

Estimated short run dynamics of real wage changes

Dependent variable: $\Delta\log(w)_t$ t-statistics in parenthesis, p-values in square brackets

	Italy	Netherlands	New Zealand	Norway	Portugal
Constant	-2.4626 (-2.30)	-0.5895 (-0.696)	5.26296 (6.03)	11.0327 (3.25)	5.3176 (2.49)
Trend	0.0079 (-2.20)	-0.0248 (-4.67)			
$\log(w)_{t-1}$	-0.3199 (-2.48)	-1.0204 (-7.03)	-1.2095 (-8.78)	-0.4864 (-1.47)	-0.4631 (-2.75)
$\Delta\log(w)_{t-1}$		0.3437 (3.23)	0.5406 (4.02)	-0.2659 (-0.942)	
$\log(UR)_{t-1}$	-0.0619 (-1.53)	-0.04344 (-3.68)	-0.01322 (-1.49)	0.0632895 (2.62)	-0.01737 (-0.307)
$\Delta\log(UR)_t$	-0.0421 (-1.67)	-0.0374 (-3.40)	0.05430 (3.70)	-0.0251 (-1.03)	-0.0540 (-0.891)
$\Delta\log(UR)_{t-1}$		0.0444 (3.52)		-0.0833 (-3.86)	
$\log(PROD)_{t-1}$	0.4634 (2.22)	2.0678 (5.21)	0.2842 (1.54)	-0.4770 (-1.91)	-0.1324 (-0.433)
$\Delta\log(PROD)_t$	0.3171 (1.04)	0.6323 (3.17)	1.09770 (4.92)	-0.5443 (-2.04)	0.0698512 (0.121)
$\Delta\log(PROD)_{t-1}$		-0.5948 (-2.85)		-0.4482 (-2.14)	
$\log(WGE)_{t-1}$	0.4304 (2.00)	0.4932 (3.74)	-0.13845 (-1.08)	-0.9570 (-2.68)	-0.5228 (-3.13)
$\Delta\log(WGE)_t$	0.1416 (0.988)	0.0787 (1.68)	-0.17285 (-1.52)	-0.2422 (-1.85)	-0.1558 (-1.17)
$\Delta\log(WGE)_{t-1}$		-0.2538 (-4.07)		0.3235 (1.92)	0.2583 (2.94)
$\log(UDEN)_{t-1}$	0.1295 (1.81)	-0.2810 (-4.33)	0.114873 (2.68)	-1.062 (-3.57)	-0.3025 (-1.82)
$\Delta\log(UDEN)_t$	0.0233 (0.238)	-0.06838 (-1.28)	0.0344287 (0.416)	0.160578 (0.662)	0.0549293 (0.246)
$\Delta\log(UDEN)_{t-1}$	-0.1692 (-1.69)				
$\log(BRR)_{t-1}$	-0.0188 (-2.85)	-1.0109 (-4.20)	-0.2557 (-2.10)	0.3604 (3.39)	0.1050 (1.71)
$\Delta\log(BRR)_t$	0.00197 (0.213)	-1.2421 (-5.90)	-0.3552 (-1.90)	0.282821 (3.92)	-0.0350 (-0.739)
$\Delta\log(BRR)_{t-1}$	0.0171 (1.84)			-0.0859 (-2.11)	
n. obs.	37	28	25	22	23
R^2	0.871834	0.968287	0.906014	0.948824	0.860928
F overall	10.69 [0.000]	20.99 [0.000]	9.64 [0.000]	5.794 [0.031	5.159 [0.007]
DW	1.74	2.36	2.12	3.21	2.55
AR 1-2 test: F	0.3529 [0.7069]	0.59648 [0.4578]	0.12354 [0.8851]	6.8218 [0.0593]	1.4571 [0.2582]
AR 1-2 test c^2	1.2615 [0.5322]	1.5761 [0.2093]	0.60282 [0.7398]	13.868 [0.0002]	3.2047 [0.0734]
RESET test:	0.8013 [0.3808]	26.956 [0.0004]	1.7992 [0.2068]	1.2633 [0.3239]	0.43320 [0.5269]

Table 3. - Continues

Estimated short run dynamics of real wage changes

Dependent variable: $\Delta\log(w)_t$ t-statistics in parenthesis, p-values in square brackets

	Spain	Sweden	Switzerland	Un. Kingdom	United States
Constant	0.5783 (1.32)	-3.144 (-1.72)	22.9013 (4.38)	-1.1770 (-1.56)	-1.69718 (-3.13)
Trend	0.0088 (2.35)	-0.0194 (-3.64)	0.0591 (4.23)		-0.0083 (-2.78)
$\log(w)_{t-1}$	-0.4566 (-2.80)	-0.6397 (-4.83)	-3.99630 (-4.96)	-0.7425 (-3.76)	-0.5234 (-4.43)
$\Delta\log(w)_{t-1}$			1.49359 (3.41)	-0.1740 (-1.17)	
$\log(UR)_{t-1}$	-0.0511 (-2.43)	-0.0531 (-1.59)	-0.0922 (-3.42)	-0.0487 (-1.75)	0.0177 (1.48)
$\Delta\log(UR)_t$	0.06195 (1.65)	-0.0395 (-2.10)	-0.0568 (-2.27)	0.0221 (1.30)	-0.0019 (-0.134)
$\Delta\log(UR)_{t-1}$	0.0688 (1.59)	0.05079 (1.53)	0.0499 (2.91)	0.0373 (1.37)	0.0282 (2.56)
$\log(PROD)_{t-1}$	0.2631 (1.13)	1.5248 (4.71)	-1.7537 (-2.97)	0.8624 (3.08)	0.7489 (4.80)
$\Delta\log(PROD)_t$	0.7043 (2.24)	0.8249 (2.48)	-0.50175 (-1.46)	0.582507 0.3047 1.91	0.6464 (4.90)
$\Delta\log(PROD)_{t-1}$			0.5191 (1.45)	-0.5568 (-2.74)	
$\log(WGE)_{t-1}$	0.1934 (1.80)	-0.1985 (-2.01)	-0.318705 (-1.15)	0.0211 (0.240)	0.2927 (1.77)
$\Delta\log(WGE)_t$	0.1259 (1.58)	-0.1161 (-0.681)	-0.1886 (-1.14)	0.0132 (0.132)	0.1306 (1.53)
$\Delta\log(WGE)_{t-1}$	-0.0789 (-1.57)		-0.1485 (-0.652)	-0.1644 (-1.53)	0.1655 (1.43)
$\log(UDEN)_{t-1}$	-0.1393 (-2.60)	-0.0011 (-0.003)	0.5479 (2.20)	0.2232 (2.36)	-0.0855 (-1.48)
$\Delta\log(UDEN)_t$	-0.0033 (-0.028)	-0.0429 (-0.155)	0.0913 (0.674)	0.0910 (0.70)	0.0041 (0.064)
$\Delta\log(UDEN)_{t-1}$		-0.3624 (-1.52)	-0.0920 (-0.76)	-0.1874 (-1.22)	
$\log(BRR)_{t-1}$	-0.04636 (-1.44)	0.169230 (3.63)	0.2208 (3.99)	-0.0454 (-1.11)	0.0132 (0.465)
$\Delta\log(BRR)_t$	-0.0245 (-0.72)	0.02578 (0.630)	0.1084 (2.36)	-0.0771 (-1.26)	-0.0059 (-0.31)
$\Delta\log(BRR)_{t-1}$		-0.07588 (-1.76)	-0.0727 (-1.43)	-0.0988 (-1.58)	-0.0409 (2.11)
n. obs.	32	34	21	34	37
R^2	0.84321	0.8316	0.978695	0.872511	0.906899
F overall	6.53 [0.000]	5.926 [0.000]	5.104 [0.176]	6.441 [0.000]	13.64 [0.000]
DW	2.78	2.44	2.9	2.36	2.05
AR 1-2 test: F	13.427 [0.0005]	4.7191 [0.0245]	21.272 [0.1359]	0.78897 [0.4735]	1.4699 [0.2549]
AR 1-2 test c^2	20.532 [0.000]	12.615 [0.0018]	20.057 [0.0000]		4.9578 [0.0838]
RESET test:	0.40698[0.5325]	0.02357 [0.8798]		0.0084740 [0.927]	0.09775 [0.757]

Table 4.
Coefficients of long run level relationship:
Dependent variable: log(w)

	Constant	log(UR)	log(PROD)	log(WGE)	log(UDEN)	log(BRR)
Australia	10.168** (8.69)	0.203 (1.55)	-0.492** (-10.12)	-0.154** (2.34)	-0.527** (-7.61)	-0.371** (-34.61)
Austria	1.237 (0.95)	-0.022 (-0.92)	0.453 (1.14)	-0.003 (-0.01)	0.148 (0.71)	0.211** (2.06)
Belgium	-9.400 (-3.91)	-0.032* (-1.48)	2.433** (5.19)	0.686** (3.39)	0.534** (4.40)	-0.153 (-1.02)
Canada	-1.802 (-2.42)	-0.170** (-3.97)	0.806** (1.80)	0.068 (0.27)	0.535** (2.51)	0.224** (4.57)
Denmark	-11.12 (-0.49)	-0.031 (-0.13)	2.98 (1.21)	-0.021 (-0.05)	-2.112** (-1.73)	2.697 (0.78)
Finland	-0.539 (-0.87)	-0.084** (-1.84)	0.637** (2.34)	0.066 (-0.19)	0.368** (2.07)	0.284** (2.60)
France	-16.09* (-1.47)	-0.161 (-0.80)	2.180** (3.50)	2.665 (1.25)	0.185* (1.32)	0.212 (0.65)
Germany	4.506 (0.38)	-0.120 (-1.19)	1.095** (4.34)	0.059 (0.04)	0.288 (0.44)	-1.634 (-0.66)
Japan	-1.33 (-1.29)	0.077** (3.36)	1.318** (27.8)	-0.134 (-1.37)	0.190 (1.10)	0.083** (1.99)
Ireland	4.933** (5.81)	0.045** (2.56)	-0.493** (-2.31)	-0.282** (-7.71)	0.366** (3.75)	-0.009 (-0.42)
Italy	-7.698* (-1.66)	-0.193* (-1.43)	1.448** (2.93)	1.345* (1.44)	0.404** (1.84)	-0.058** (-2.06)
Netherlands	-0.578 (-0.69)	-0.042** (-4.35)	2.026** (10.14)	0.483** (3.83)	-0.275** (-5.33)	-0.990** (-6.31)
New Zeland	4.351** (9.48)	-0.011* (1.45)	0.235* (1.56)	-0.114 (-1.11)	0.094** (2.90)	-0.211** (-2.19)
Norway	22.68** (1.75)	0.130 (1.29)	-0.980 (-0.96)	-1.968* (1.48)	-2.184* (-1.64)	0.741* (1.39)
Portugal	11.483** (5.79)	-0.038 (-0.30)	-0.286 (-0.41)	-1.129 (-2.27)	-0.653 (?)	0.227* (1.70)
Spain	1.267 (1.17)	-0.112** (-1.79)	0.576* (1.66)	0.424* (1.36)	-0.305** (-1.99)	-0.102* (-1.46)
Sweden	-4.915** (-2.01)	-0.083** (-1.78)	2.383** (8.23)	-0.310** (-2.01)	-0.002 (-0.003)	0.265** (3.36)
Switzerland	5.730** (9.67)	-0.023** (-6.33)	-0.438** (-3.31)	-0.080 (-1.36)	0.137 ()	0.055 ()
United Kingdom	-1.585** (-2.17)	-0.066** (-2.07)	1.161** (12.18)	0.028 (0.24)	0.300** (4.55)	-0.061 (-1.17)
United States	-3.242** (-3.57)	0.034* (1.61)	1.430** (9.26)	0.559** (1.94)	-0.163* (-1.45)	0.025 (0.45)

t- statistics in parenthesis. ** and * denote significance at 5% and at 10% respectively.
w is the real wage, UR is the unemployment rate, PROD is productivity, WGE is the tax wedge, UDEN is union density, BRR is the benefit replacement ratio

Table 5 a. –

Institutions and the responsiveness of the real wage to unemployment.

Dependent variable: elasticity of the real wage to unemployment (from Table 4), in absolute value

Sample: all countries (20 observations). P-values in square brackets

	(1)	(2)	(3)	(4)
Constant	0.116458 [0.0193]	0.112919 [0.05]	0.143081 [0.05]	0.133557 [0.06]
BRR	-0.000763 [0.4991]	-0.000783 [0.50]	-0.000864 [0.47]	-0.001186 [0.33]
BD	-0.002277 [0.3138]	-0.006022 [0.83]	-0.008089 [0.77]	0.007129 [0.81]
BC		0.002876 [0.89]	0.003820 [0.86]	-0.012274 [0.62]
UD			-0.000678 [0.46]	-0.000540 [0.53]
EP				0.042687 [0.23]
R^2	0.060987	0.062138	0.097438	0.190075
Adjusted R^2	-0.049485	-0.113711	-0.143246	-0.099184
S.E. of regression	0.062417	0.064299	0.065146	0.063878
F-statistic	0.552058	0.353359	0.404838	0.657111
Prob(F-statistics)	0.585745	0.787335	0.802272	0.661484

Table 5 b. –

Institutions and the responsiveness of the real wage to unemployment.

Dependent variable: elasticity of the real wage to unemployment (from Table 4), in absolute value

Sample: countries with negative unemployment coefficient (15 observations) ♦. P-values in square brackets

	(1)	(2)	(3)	(4)
Constant	0.101157 [0.08]	0.090056 [0.18]	0.151274 [0.07]	0.126960 [0.16]
BRR	-0.000437 [0.72]	-0.000481 [0.71]	-0.000778 [0.54]	-0.000844 [0.52]
BD	-0.001922 [0.42]	-0.013564 [0.69]	-0.020150 [0.55]	-0.009901 [0.79]
BC		0.008936 [0.73]	0.012625 [0.62]	0.001592 [0.96]
UD			-0.001283 [0.20]	-0.001077 [0.30]
EP				0.033646 [0.43]
R^2	0.055755	0.066118	0.212773	0.268793
Adjusted R^2	-0.101620	-0.188577	-0.102118	-0.137434
S.E. of regression	0.062535	0.064956	0.062549	0.063543
F-statistic	0.354280	0.259596	0.675703	0.661682
Prob(F-statistics)	0.708777	0.852998	0.623996	0.661711

♦ The countries included are: Austria, Belgium, Canada, Denmark, Finland, France, Germany, Italy, Netherlands, New Zealand Portugal, Spain, Sweden, Switzerland, United Kingdom.

Table 5 c. –

Institutions and the responsiveness of the real wage to unemployment.

Dependent variable: elasticity of the real wage to unemployment (from Table 4), in absolute value

Sample: countries with negative and significant unemployment coefficient (10 observations)♠. P-values in square brackets

	(1)	(2)	(3)	(4)
Constant	0.165079 [0.02]	0.275063 [0.01]	0.265197 [0.02]	0.242997 [0.01]
BRR	-0.001157 [0.36]	-0.000530 [0.64]	-0.000271 [0.83]	-0.000110 [0.90]
BD	-0.092442 [0.10]	-0.118805 [0.04]	-0.127625 [0.05]	-0.124395 [0.02]
BC		-0.067989 [0.13]	-0.081631 [0.13]	-0.124274 [0.03]
UD			0.000678 [0.55]	0.001361 [0.16]
EP				0.059944 [0.06]
R^2	0.391523	0.600599	0.630256	0.859926
Adjusted R^2	0.217673	0.400899	0.334461	0.684833
S.E. of regression	0.054299	0.047517	0.050082	0.034464
F-statistic	2.252069	3.007504	2.130717	4.911267
Prob(F-statistics)	0.175733	0.116473	0.214111	0.074139

♠ The countries included are: Belgium, Canada, Finland, Italy Netherlands New Zealand, Spain, Sweden, Switzerland, United Kingdom